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New Binary Integration Stratagies and Corresponding R_{90} Calculations

by

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Captain, Republic of Korea Army
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Submitted in partial fulfillment of the
requirements for the degree of

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Often to increase the probability of having a track that will not later be deleted by a radar some simple logic criterion is used. This thesis evaluates the performance of a new binary integration technique. This technique requires M hits out of N looks with $x<M$ hits being consecutive. Closed form expressions for the cumulative probability of detection are derived and Monte Carlo methods are used to verify the results. A significant increase in the cumulative probability of detection is shown to occur when this type of logic is imposed. Also derived are the corresponding confidence calculations on R_{60}- R_{95} (a measure of radar performance defined as the range such that the cumulative probability of detecting an approaching target is 0.60-0.95) for each set of detections.

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TABLE OF CONTENTS

I. INTRODUCTION 1

A. INTEGRATION OF PULSES FOR TARGET DETECTION 2

B. R_{90} SPECIFICATION 3

C. PRINCIPAL CONTRIBUTIONS 4

D. THESIS OUTLINE 4

II. BACKGROUND 5

A. SINGLE-LOOK PROBABILITIES 5

1. Probability of False Alarm 5

2. Probability of Detection 6

B. BINARY INTEGRATION 7

C. CALCULATION OF R_{90} FROM BLIP SCAN RATIO 28

D. CALCULATION OF R_{90} FROM DIRECT OBSERVATION . 30

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III. CUMULATIVE PROBABILITY OF DETECTION USING M OUT OF N WITH AT LEAST X CONSECUTIVE HITS 36

A. CLOSED FORM EXPRESSION FOR CUMULATIVE PROBABILITY OF DETECTION 38

B. EXACT VALUE OF CONFIDENCE BOUND ON R_{60}-R_{95} IN A GIVEN NUMBER OF DETECTION 63

IV. CONTRIBUTION, STRENGTHS, AND LIMITATIONS 67

APPENDIX. A EXAMPLE OF THE MONTE CARLO SIMULATION RESULTS USING SAS WITH 1000 POINTS FOR 3 OUT OF N WITH AT LEAST 2 CONSECUTIVE HITS 69

LIST OF REFERENCES 123

INITIAL DISTRIBUTION LIST 125

LIST OF FIGURES

FIGURE 2-1 PROBABILITY OF DETECTION p_{CD} AND PROBABILITY OF FALSE ALARM P_{FA} 6

FIGURE 2-2 CUMULATIVE PROBABILITY OF DETECTION FOR 1 OUT OF N LOOKS 8

FIGURE 2-3 IMPROVEMENT FACTOR FOR 1 HIT OUT OF N LOOKS 9

FIGURE 2-4 CUMULATIVE PROBABILITY OF FALSE ALARM FOR 1 MISS OUT OF N LOOKS 10

FIGURE 2-5 CUMULATIVE PROBABILITY OF DETECTION FOR 2 HITS OUT OF 3 LOOKS 13

FIGURE 2-6 IMPROVEMENT FACTOR FOR 2 HITS OUT OF 3 LOOKS 14

FIGURE 2-7 CUMULATIVE PROBABILITY OF DETECTION FOR M HITS OUT OF N LOOKS 15

FIGURE 2-8 IMPROVEMENT FACTOR FOR M HITS OUT OF N LOOKS 16

FIGURE 2-9 CUMULATIVE PROBABILITY OF DETECTION FOR 2 CONSECUTIVE HITS OUT OF N LOOKS ($P_{CD2,2}$) 20

FIGURE 2-10 IMPROVEMENT FACTOR FOR 2 CONSECUTIVE HITS OUT OF N LOOKS 21

FIGURE 2-11 CUMULATIVE PROBABILITY OF DETECTION FOR 3 CONSECUTIVE HITS OUT OF N LOOKS ($P_{CD3,3}$) 26

FIGURE 2-12 IMPROVEMENT FACTOR FOR 3 CONSECUTIVE HITS OUT OF N LOOKS 27

FIGURE 3-1 CUMULATIVE PROBABILITY OF DETECTION FOR 3 OUT OF N WITH AT LEAST 2 CONSECUTIVE HITS 41

FIGURE 3-2 IMPROVEMENT FACTOR FOR 3 OUT OF N WITH AT LEAST 2 CONSECUTIVE HITS 42

FIGURE 3-3 CUMULATIVE PROBABILITY OF DETECTION FOR 4 OUT OF N WITH AT LEAST 2 CONSECUTIVE HITS 45

FIGURE 3-4 IMPROVEMENT FACTOR FOR 4 OUT OF N WITH AT LEAST 2 CONSECUTIVE HITS 46

FIGURE 3-5 CUMULATIVE PROBABILITY OF DETECTION FOR 5 OUT OF N WITH AT LEAST 2 CONSECUTIVE HITS 48

FIGURE 3-6 IMPROVEMENT FACTOR FOR 5 OUT OF N WITH AT LEAST 2 CONSECUTIVE HITS 49

FIGURE 3-7 CUMULATIVE PROBABILITY OF DETECTION FOR 4 OUT OF N WITH AT LEAST 3 CONSECUTIVE HITS 55

FIGURE 3-8 IMPROVEMENT FACTOR FOR 4 OUT OF N WITH AT LEAST 3 CONSECUTIVE HITS 56

FIGURE 3-9 CUMULATIVE PROBABILITY OF DETECTION FOR 5 OUT OF N WITH AT LEAST 3 CONSECUTIVE HITS 58

FIGURE 3-10 IMPROVEMENT FACTOR FOR 3 OUT OF N WITH AT LEAST 3 CONSECUTIVE HITS 59

LIST OF TABLES

TABLE 2-1 2 HITS OUT OF 3 LOOKS 12

TABLE 2-2 2 CONSECUTIVE HITS OUT OF 3 LOOKS 17

TABLE 2-3 2 CONSECUTIVE HITS OUT OF N LOOKS 18

TABLE 2-4 COEFFICIENTS C_i FOR 2 CONSECUTIVE HITS OUT OF N LOOKS 22

TABLE 2-5 3 CONSECUTIVE HITS OUT OF N LOOKS 23

TABLE 2-6 COEFFICIENTS C_j FOR 3 CONSECUTIVE HITS OUT OF N LOOKS 25

TABLE 2-7 MINIMUM NUMBER OF DETECTIONS NEEDED TO STATE $X_{(K)}$ IS A LOWER $(1-\alpha)$ CONFIDENCE BOUND 32

TABLE 3-1 3 OUT OF 4 WITH AT LEAST 2 CONSECUTIVE HITS 37

TABLE 3-2 3 OUT OF N WITH AT LEAST 2 CONSECUTIVE HITS 39

TABLE 3-3 S_n TABLE FOR M OUT OF N WITH AT LEAST 2 CONSECUTIVE HITS 40

TABLE 3-4 4 OUT OF N WITH AT LEAST 2 CONSECUTIVE HITS 43

TABLE 3-5 5 OUT OF N WITH AT LEAST 2 CONSECUTIVE HITS 47

TABLE 3-6 REQUIRED SINGLE-LOOK PROBABILITY OF DETECTION $P_{CD(M),2}=0.9$ 51

TABLE 3-7 REQUIRED SINGLE-LOOK PROBABILITY OF DETECTION $P_{CD(M),2}=0.95$ 52

TABLE 3-8 REQUIRED SINGLE-LOOK PROBABILITY OF DETECTION $P_{CD(M),2}=0.99$ 53

TABLE 3-9 4 OUT OF N WITH AT LEAST 3 CONSECUTIVE HITS 54

TABLE 3-10 5 OUT OF N WITH AT LEAST 3 CONSECUTIVE HITS 57

TABLE 3-11 S_n TABLE FOR M OUT OF N WITH AT LEAST 3 CONSECUTIVE HITS 61

TABLE 3-12 REQUIRED SINGLE-LOOK PROBABILITY OF DETECTION $P_{CD(M),3}=0.9$ 61

TABLE 3-13 REQUIRED SINGLE-LOOK PROBABILITY OF DETECTION $P_{CD(M),3}=0.95$ 62

TABLE 3-14 REQUIRED SINGLE-LOOK PROBABILITY OF DETECTION $P_{CD(M),3}=0.99$ 63

TABLE 3-15 EXACT VALUE OF CONFIDENCE BOUND ON R_{60}-R_{95} FOR $X_{(1)}$ 64

TABLE 3-15 EXACT VALUE OF CONFIDENCE BOUND ON R_{60}-R_{95} FOR $X_{(2)}$ 65

TABLE 3-15 EXACT VALUE OF CONFIDENCE BOUND ON R_{60}-R_{95} FOR $X_{(3)}$ 65

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Finally, I thank to my wife, Meekyoung, and my heart, Yeonsoo, who was born during my graduate studies.

I. INTRODUCTION

A basic consideration in either a search or tracking radar is the range at which the radar can detect the target. This obviously depends on the parameters of the radar(e.g., transmitter power, antenna gain, signal processing etc.) and on the reflection characteristics of the target(e.g. radar cross section). However, a fundamental limitation is that the target must be detected in an interference background, which as a minimum consists of the ever-present receiver thermal noise. Because receiver noise is a random process, it must be described in terms of its statistical properties. Therefore, radar detection is a statistical problem. When the range of a radar is specified, it must be stated in a statistical manner in order to be meaningful[1].

The detection of weak signals in the presence of noise is equivalent to deciding whether the receiver output is due to noise alone or to signal-plus-noise. This is the type of decision that can be made by a human operator on the basis of the information present on a radar scope. When the detection process is carried out automatically by electronic means without the aid of an operator, the detection criterion cannot be changed and must be carefully specified and built into the decision-making device by the radar designer. To increase the probability of making a correct decision on the presence of a target, a train of target pulses is usually transmitted and received. This type of radar is known as a pulsed radar. Integrating several pulses(instead of one) to determine whether a target is present has significant advantages.

A. INTEGRATION OF PULSES FOR TARGET DETECTION

There are four distinct ways in which the information from a received train of pulses may be processed to improve detection performance. In order of declining complexity of implementation they are [2]:

1) Coherent integration, in which the pulses are added prior to envelope detection;
2) Noncoherent integration, in which each pulse is envelope detected and the resulting video pulses are added together prior to application of thresholding;
3) Binary integration, in which each pulse is applied to a threshold and the number of threshold crossings is used as the criterion for an output alarm;
4) Cumulative detection, in which one threshold crossing is the alarm criterion.

This thesis is concerned with the third technique, binary integration. After the threshold stage, the radar return information assumes a binary form. That is, the information is a "1" if the signal was above the threshold and "0" if it was below the threshold. At this point, binary integration algorithms can be applied to improve target declaration. If the threshold crossing satisfies the binary integration criterion, the detected target and its corresponding range are passed on for track file processing.

In its simplest form, a decision is made based on "1" hit out of

N looks or scans. In this strategy for a given cumulative detection probability there is a strong dependence of the required single look(scan) probability of detection on the number of looks(scans). As the number of looks increase the required single look probability of detection decreases for a given cumulative probability of detection. In other words, as the number of looks increase, the cumulative probability of detection increases. The downfall of this strategy however, is the cumulative false alarm probability also increases. A binary integration strategy that overcomes this limitation is the use of consecutive hits(e.g., 2 consecutive hits out of 3). As the number of looks increase, the probability of detection increases while the probability of false alarm decreases. A third strategy is to require at least M hits out of N looks without regard to their location with respect to each others. **This thesis presents a new strategy, which is the main subject of this research. This algorithm requires M hits out of N looks with x<M number of hits consecutive.** The performance of this integration strategy is also examined and compared with the other strategies mentioned above. Closed form expressions are derived for the cumulative probability of detection.

B. R_{90} SPECIFICATION

An important related measure of radar performance is the R_{90} specification. This is the range such that the cumulative probability of detection(e.g,. binary integration detection) of an approaching target is 0.90. This specification is computed using either blip scan ratios or more commonly the observed detection ranges of the target. R_{90} calculations are derived for the new binary integration strategies. This represents the probability that a confirmed track(that will not later be deleted) emerges at a given range.

C. PRINCIPAL CONTRIBUTIONS

The principal contributions of this thesis lie in the area of closed form expressions for the cumulative probability of detection for several new binary integration strategies of the form M hits out of N looks with $x<M$ hits consecutive. These algorithms are compared numerically with other popular techniques. The new results are also used to derive corresponding R_{90} confidence intervals.

D. THESIS OUTLINE

The material in this thesis is sectioned into 3 parts. Section II gives some background and review the popular integration strategies. Also discussed are the corresponding R_{90} confidence intervals. Section III gives the results for the new binary integration strategy and derives the corresponding R_{60}-R_{95} confidence intervals. These results are useful for finding cumulative probability of detection(that can have a probability of target tracking which is not later deleted in any given range) and exact value of confidence coefficient in a given number of detections. The final chapter gives a summary of the research but concentrates on the main contribution and several limitations.

II. BACKGROUND

In this section some conventional binary integration strategies are reviewed. These solutions are used to derived the new results given in section III.

A. SINGLE-LOOK PROBABILITIES

1. Probability of False Alarm

With few exceptions the noise probability density at the output of each range/Doppler cell can be assumed to be Gaussian. To be precise, both the real and imaginary components are jointly Gaussian and independent. Since the magnitude of two Gaussian random variables is Rayleigh distributed and the magnitude squared is exponentially distributed, the probability density of interest is[2]

$$p(Z)=e^{-Z} \tag{1}$$

where $Z=|N|^2/(\sigma)^2=(N_I^2+N_Q^2)/(\sigma)^2$

N_I=noise in I component of the sum channel S

N_Q=noise in Q component of the sum channel S

σ^2=noise power=$E(N_I^2+N_Q^2)$

Thus, the probability of the noise exceeding the threshold, $|N|>T_h$, is

$$p_{FA}=\int_{T_h^2/\sigma^2}^{\infty} p(Z)\,dZ$$

$$=e^{\frac{-T_h^2}{\sigma^2}} \qquad (2)$$

and is the single look probability of false alarm.

2. Probability of Detection

When a target signal is present with the noise a threshold is applied to isolate the target return from the noise. If the signal plus noise exceeds T_h, a target is declared to be present at that range/Doppler location. As shown in Figure 2-1, P_D is the probability of a target return plus noise exceeding the threshold T_h.

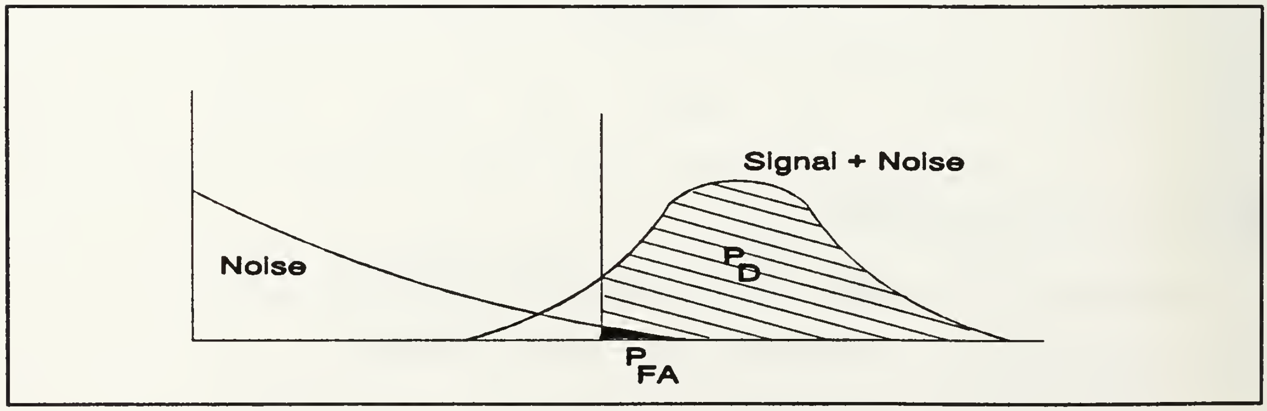

Figure 2-1 Probability of Detection p_D and False Alarm p_{FA}

The noise varies considerably from one target to the next and from one operational situation to another. Gaussian statistics are sometimes justifiable, particularly if (1) the target's extent is large compared to a wavelength and (2) many individual scattering centers contribute to the overall signal level. Assuming Gaussian statistics, the single-look p_D is then given by

$$p_D = \int_{T_h^2/\sigma^2}^{\infty} p(Z)\,dZ$$

$$= e^{\frac{-T_h^2}{(\sigma^2(SNR+1))}} \tag{3}$$

where SNR is the target's average signal-to-noise ratio. Note that, since the signal plus noise is zero-mean Gaussian, the probability p_D is completely specified by the signal power, σ^2SNR, the noise power σ^2, and the threshold T_h.

B. BINARY INTEGRATION

To improve the probability of detection over the single look decision, binary integration can be used. The simplest binary integration is to require 1 hit out of N looks. The cumulative probability of detection for this criteria is

$$P_{CD} = 1 - (1 - p_D)^N \tag{4}$$

and is plotted in Figure 2-2 as a function of P_D for N=3,6,9,and 12.

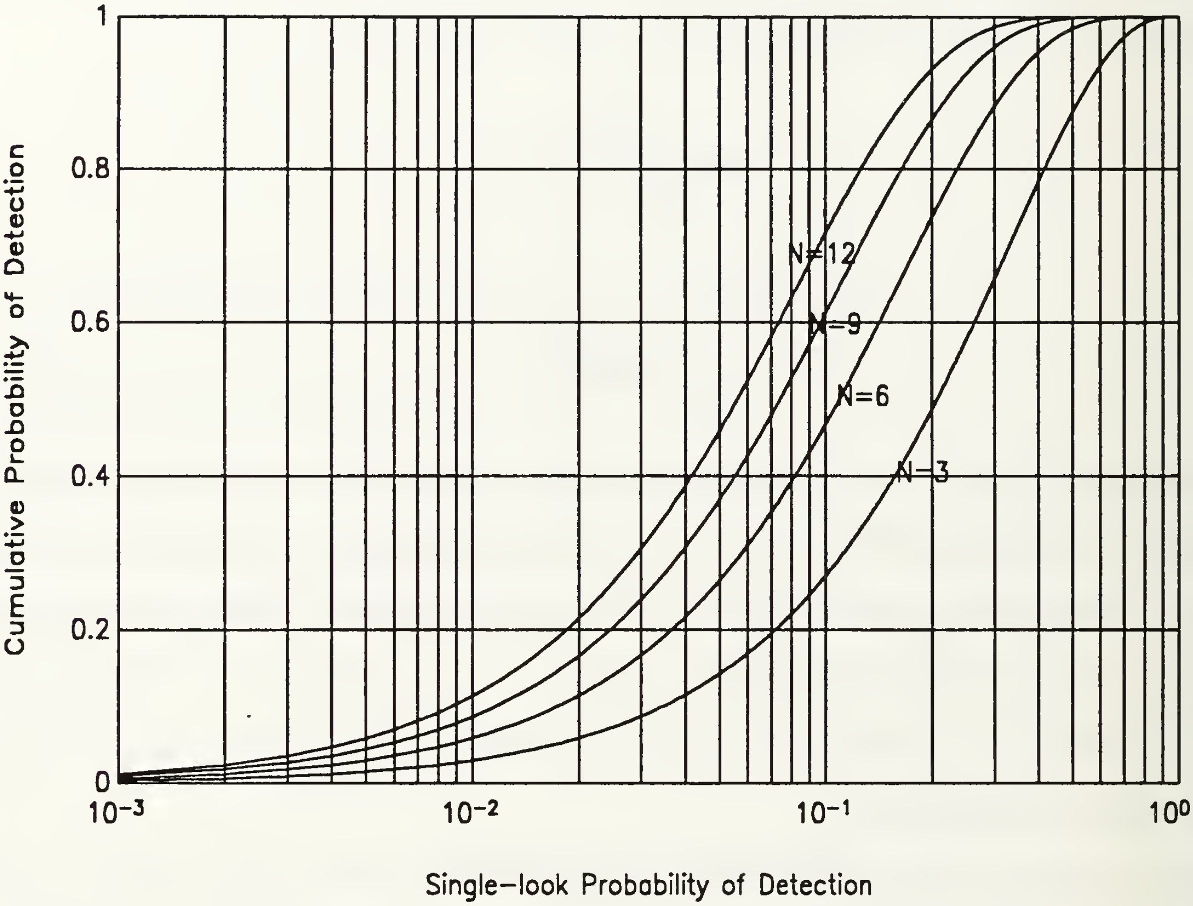

Figure 2-2 Cumulative Probability of Detection for 1 Hit out of N Looks

The improvement factor over the single look probability of detection p_D can be expressed as

$$I_D = \frac{P_{CD}}{p_D} \qquad (5)$$

and is plotted in Figure 2-3 as a function of P_D for N=3,6,9, and 12.

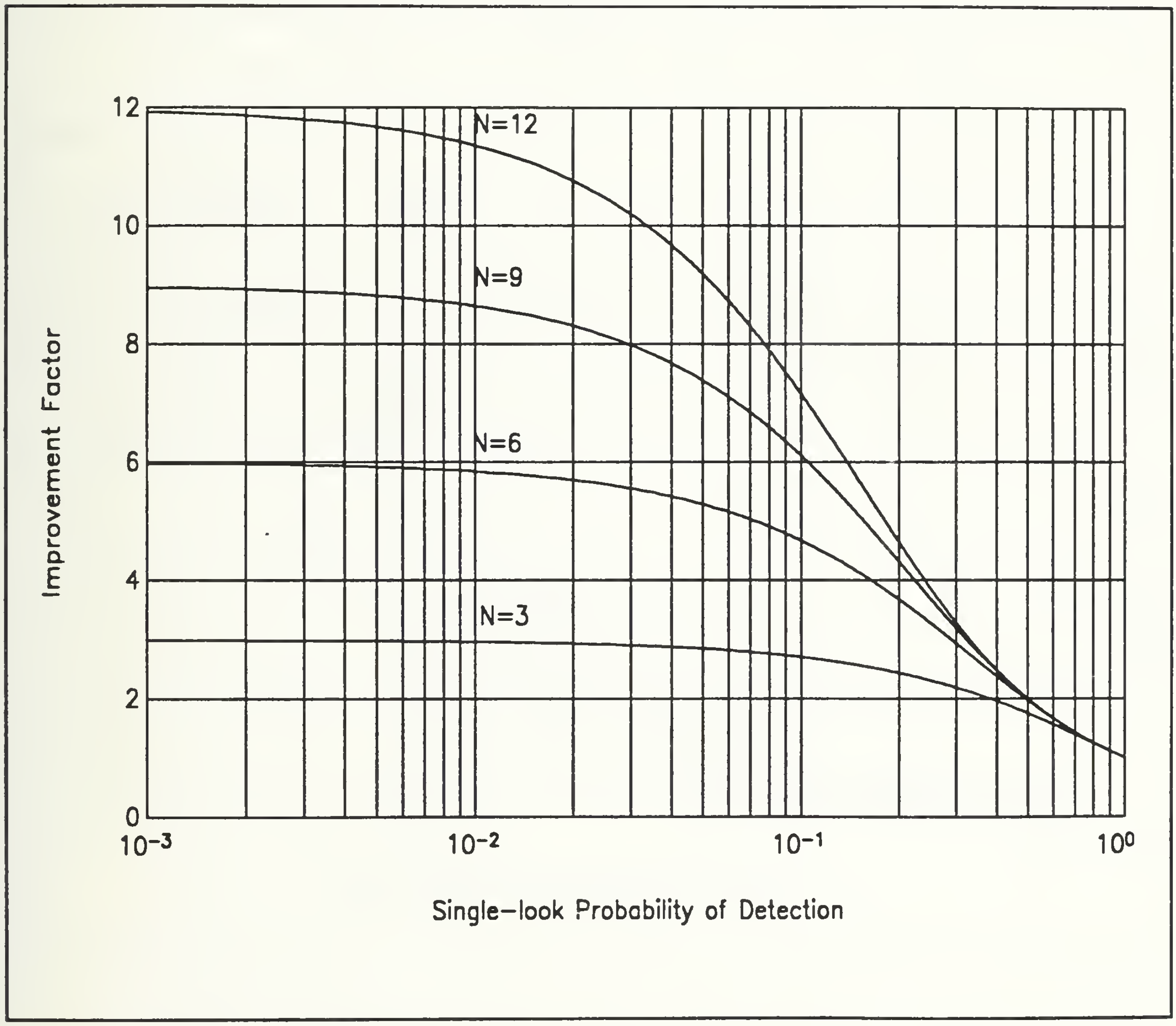

Figure 2-3 Improvement Factor for 1 Hit out of N looks

The same reasoning can be applied to the cumulative probability of false alarm which gives

$$P_{CFA}=1-(1-p_{FA})^{N} \tag{6}$$

and is shown in Figure 2-4 as a function of p_D for N=3,6,9,and 12. These plots indicate the problem with this approach. That is, as the cumulative probability of detection increases, so does the cumulative probability of false alarm.

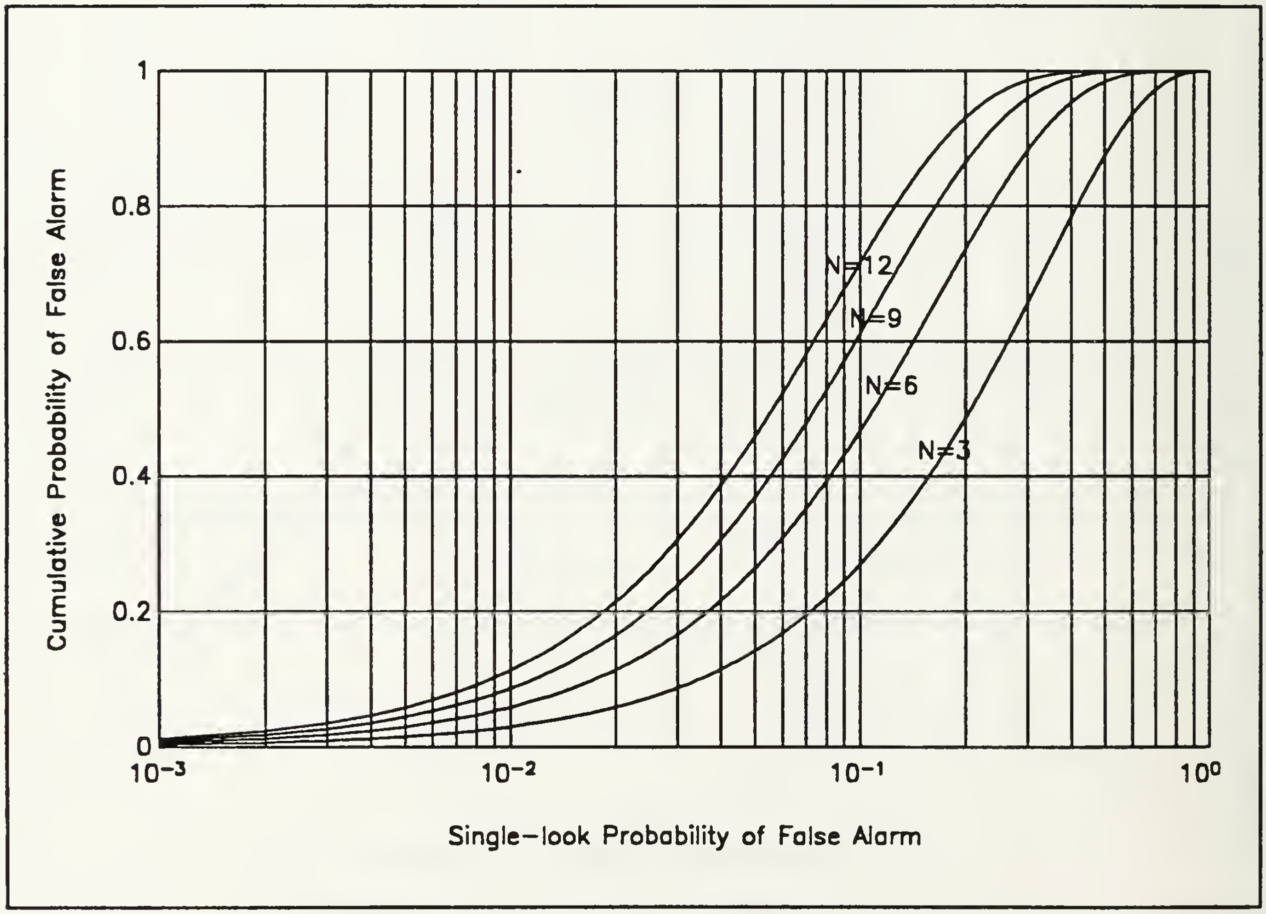

Figure 2-4 Cumulative Probability of False Alarm for 1 Miss out of N Looks

As mentioned previously, increasing the number of looks, increases the cumulative probability of detection but also increases the cumulative probability of false alarm. To increase the cumulative probability of detection P_{CD} without increasing the cumulative probability of false alarm some simple logic criterion can be used, such as 2 hits out of 3 looks without regard to their location with respect to each other. To derive the result Table 2-1 lists all possible outcomes for three looks at a target with M meaning miss and H meaning hit. Also shown is the associated probability. Each column is an event and since no rows are duplicated they are mutually exclusive. Note that only in rows 0, 1, 2, and 4 are there 2 hits out of 3 looks. If p_D is the probability of a hit on a single look, then the cumulative probability of detection P_{CD} for this case may be found by summing the probability for the successful events P_{CD} as

$$P_{CD}=3p_D^2(1-p_D)p_D^3 \tag{7}$$

TABLE 2-1 2 HITS OUT OF 3 LOOKS

Row Number	Looks #			Probability of Detection	Output
	1	2	3		
0	H	H	H	p_D^3	1
1	H	H	M	$p_D^2(1-P_D)$	1
2	H	M	H	$p_D^2(1-P_D)$	1
3	H	M	M	0	0
4	M	H	H	$p_D^2(1-P_D)$	1
5	M	H	M	0	0
6	M	M	H	0	0
7	M	M	M	0	0
$P_{CD}=3P_D^2(1-p_D)+p_D^3$					

The cumulative probability of detection and the improvement factor for this algorithm is shown in Figure 2-5 and Figure 2-6.

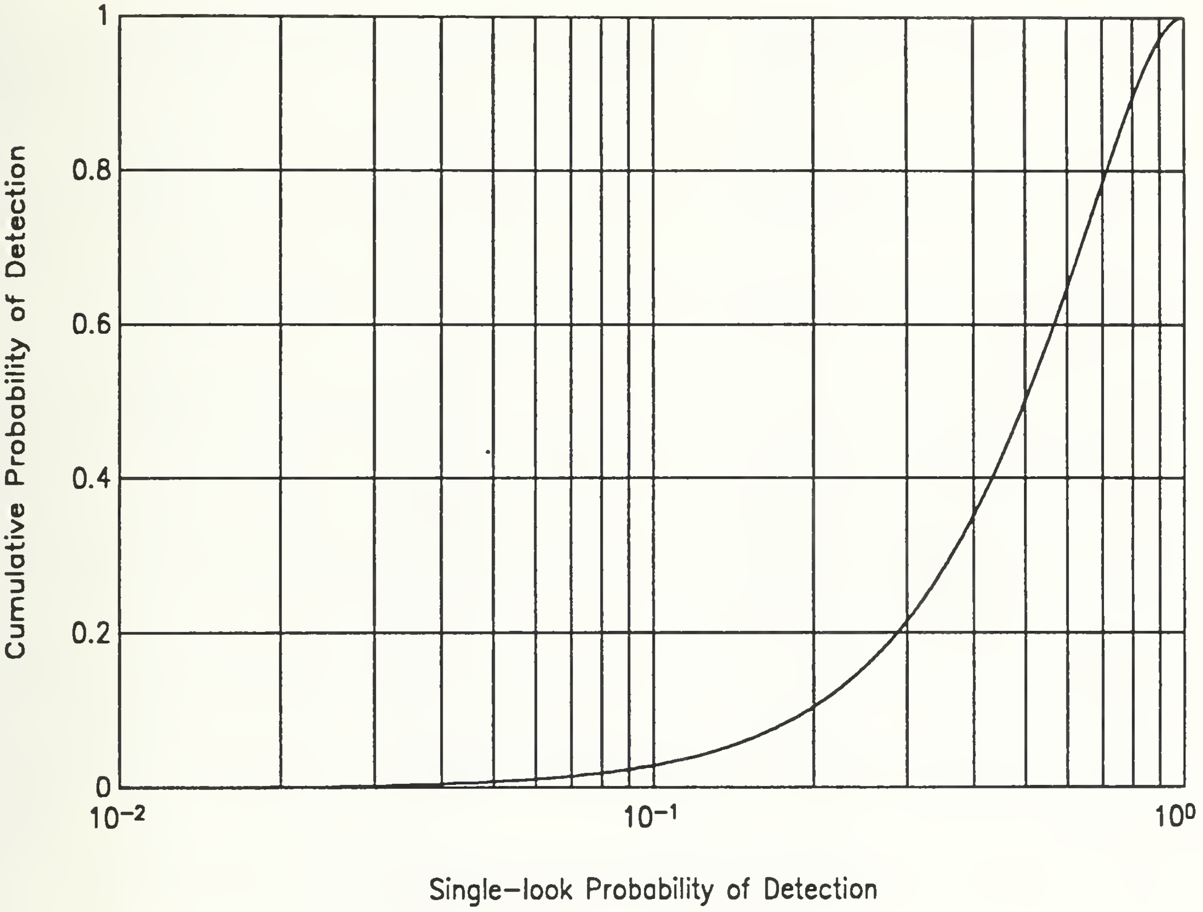

Figure 2-5 Cumulative Probability of Detection for 2 Hits out of 3 Looks

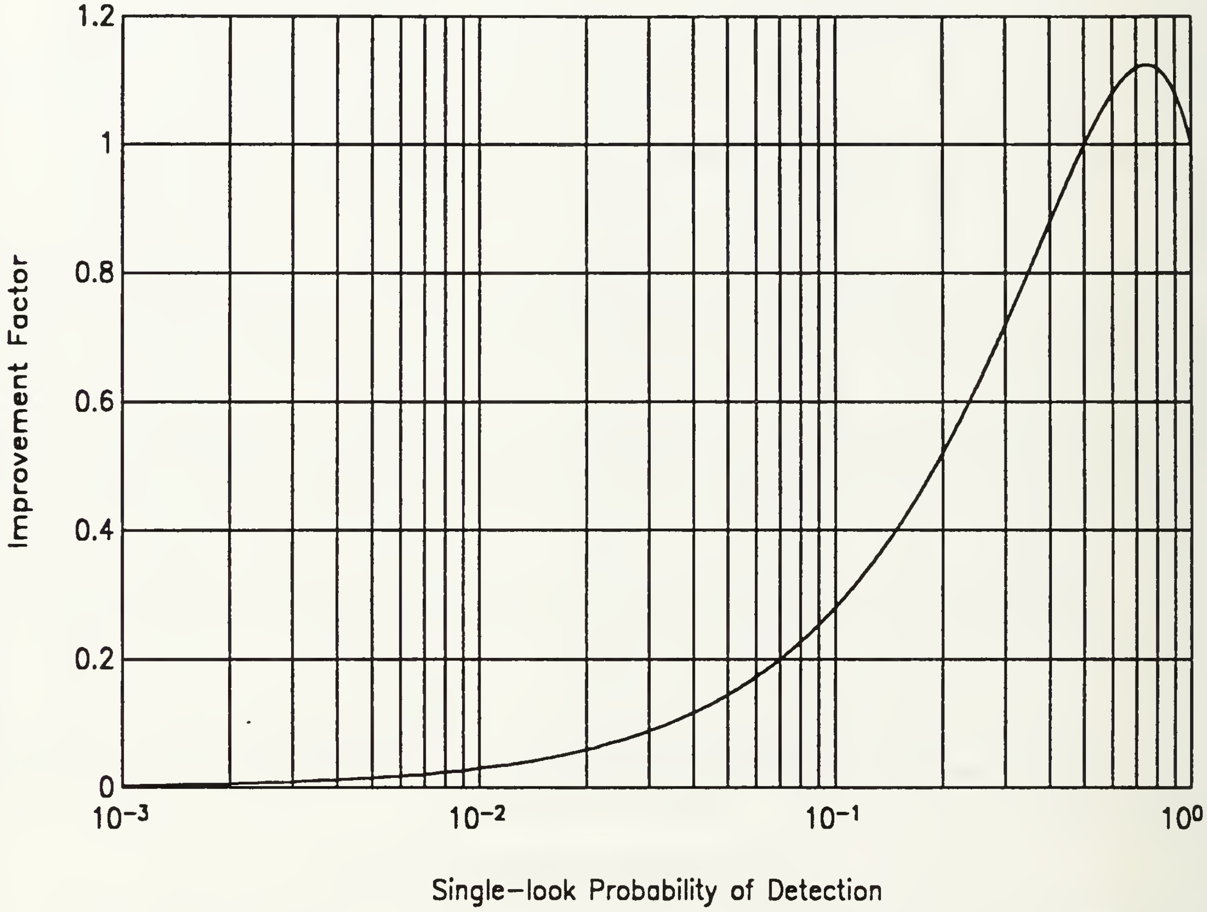

Figure 2-6 Improvement Factor for 2 Hits out of 3 Looks

In general, the cumulative probability of detection for the M hits out of N looks integration logic follows a binomial distribution given by

$$P_{CD}=\sum_{i=M}^{N}\binom{N}{i}p_D^{\,i}(1-p_D)^{N-i} \tag{8}$$

and is shown in Figure 2-7 for N=3,6,9, and 12.

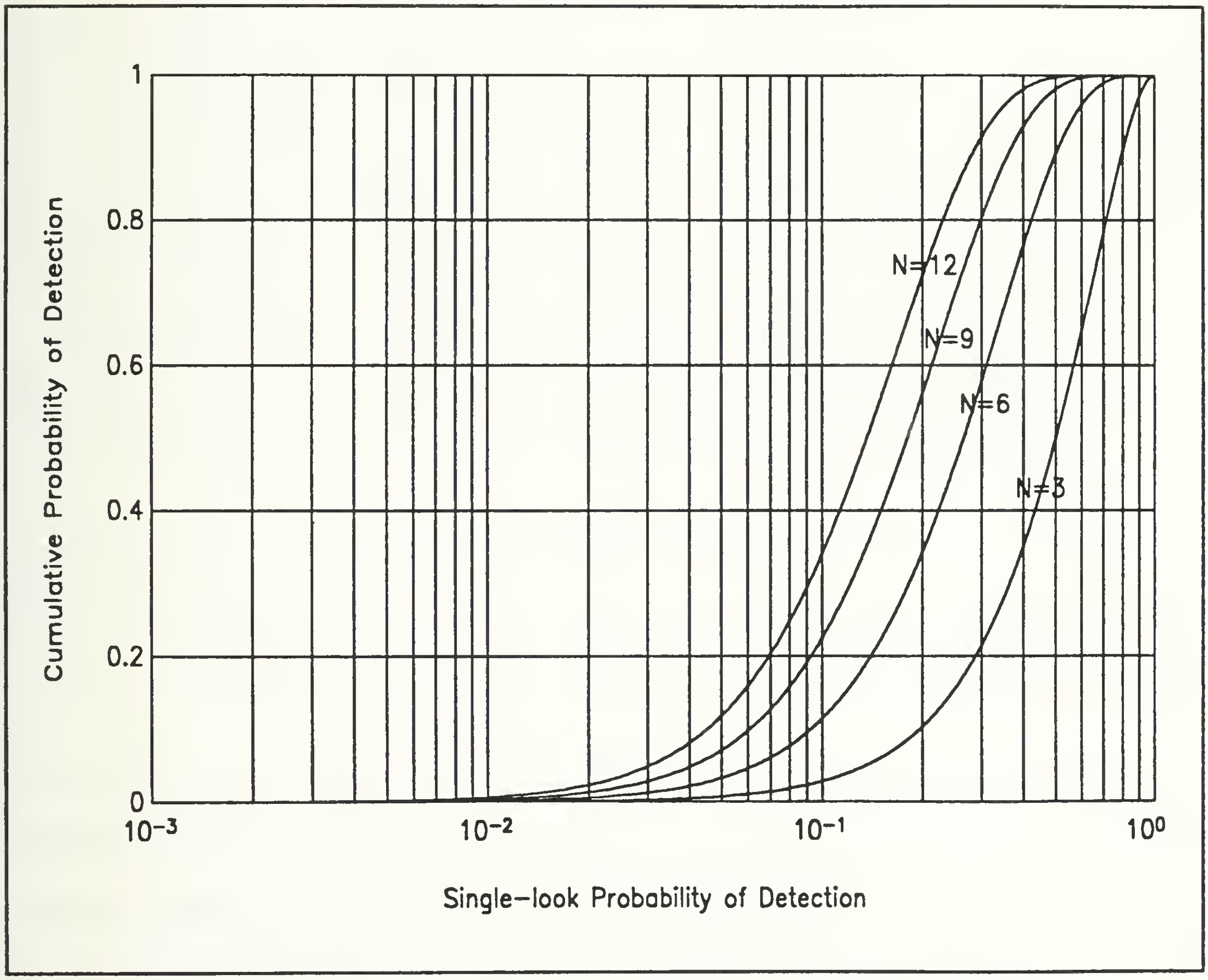

Figure 2-7 Cumulative Probability of Detection for M Hits out of N Looks

The improvement factor is shown in Figure 2-8.

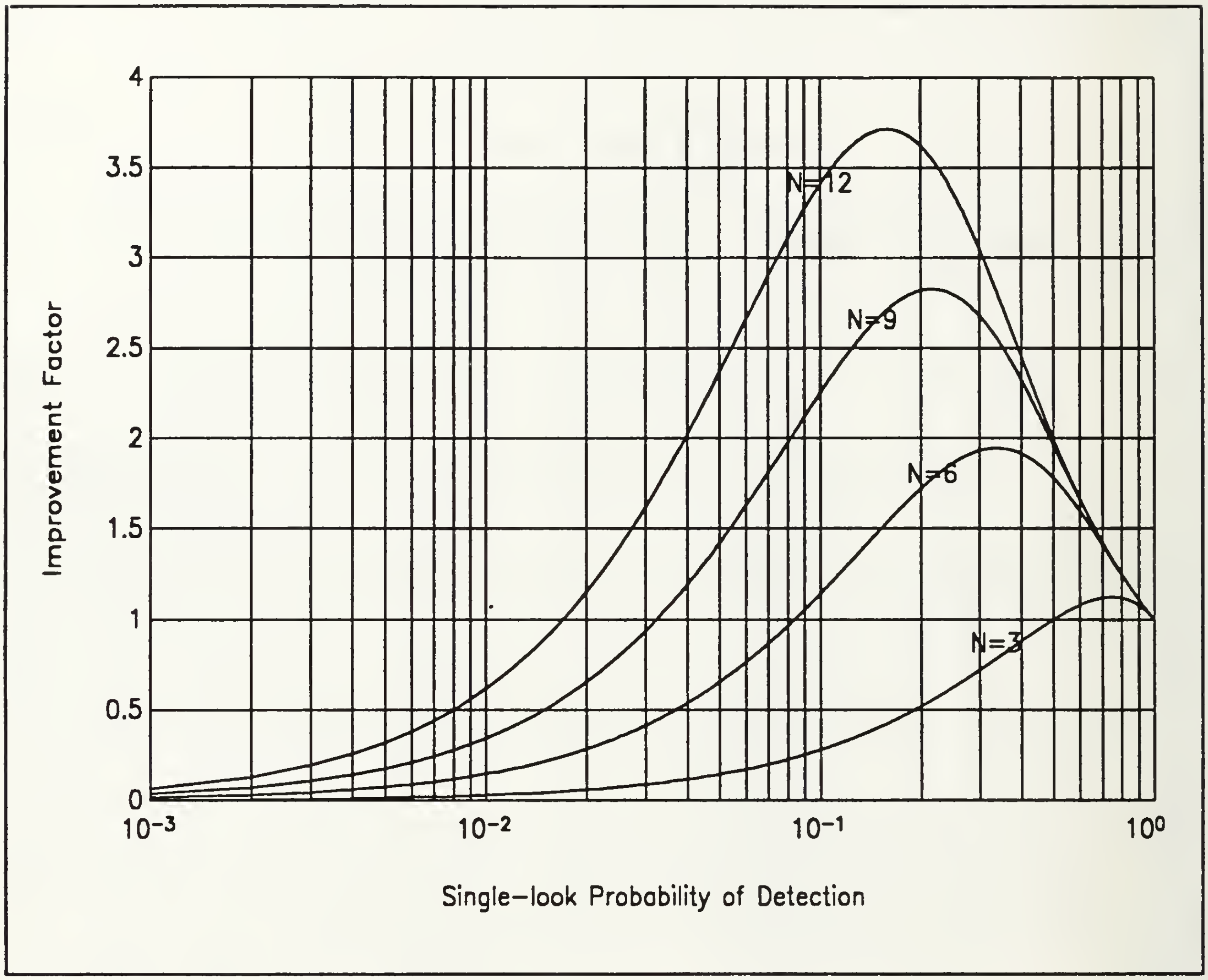

Figure 2-8 Improvement Factor for M Hits out of N Looks

The more complicated logic that there be M consecutive hits out of N looks results in a different performance. Counting of mutually exclusive events is customarily used to derive the performance. Table 2-2 shows the result for 2 consecutive hits in 3 looks. By counting mutually exclusive events the cumulative probability of detection for 2 consecutive hits out of 3 looks is

$$P_{CD}=2P_D^2(1-P_D)+P_D^3 \tag{9}$$

TABLE 2-2 2 CONSECUTIVE HITS OUT OF 3 LOOKS

Row Number	Looks #			Probability of Detection	Output
	1	2	3		
0	H	H	H	p_D^3	1
1	H	H	M	$p_D^2(1-P_D)$	1
2	H	M	H	0	0
3	H	M	M	0	0
4	M	H	H	$p_D^2(1-P_D)$	1
5	M	H	M	0	0
6	M	M	H	0	0
7	M	M	M	0	0
$P_{CD}=2P_D^2(1-p_D)+p_D^3$					

To understand the structure behind this integration technique Table 2-3 lists the analytical results for the cumulative probability of detection using 2 consecutive hits out of N looks where N ranges from 2 to 12.

Here the notation $P_{CDx,y}$ is used to indicate the cumulative probability of detection for x hits out of N looks with y hits consecutive.

TABLE 2-3 2 CONSECUTIVE HITS OUT OF N LOOKS

N	$P_{CD2,2}$
2	p_D^2
3	$2p_D^2(1-p_D)+p_D^3$
4	$3p_D^2(1-p_D)^2+4p_D^3(1-p_D)+p_D^4$
5	$4p_D^2(1-p_D)^3+9p_D^3(1-p_D)^2+5p_D^4(1-p_D)+p_D^5$
6	$5p_D^2(1-p_D)^4+16p_D^3(1-p_D)^3+15p_D^4(1-p_D)^2+6p_D^5(1-p_D)+p_D^6$
7	$6p_D^2(1-p_D)^5+25p_D^3(1-p_D)^4+34p_D^4(1-p_D)^3+21p_D^5(1-p_D)^2+7p_D^6(1-p_D)+p_D^7$
8	$7p_D^2(1-p_D)^6+36p_D^3(1-p_D)^5+65p_D^4(1-p_D)^4+56p_D^5(1-p_D)^3+28p_D^6(1-p_D)^2+8p_D^7(1-p_D)+p_D^8$
9	$8p_D^2(1-p_D)^7+49p_D^3(1-p_D)^6+110p_D^4(1-p_D)^5+126p_D^5(1-p_D)^4+84p_D^6(1-p_D)^3+36p_D^7(1-p_D)^2+9p_D^8(1-p_D)+p_D^9$

10	$9p_D^2(1-p_D)^8+64p_D^3(1-p_D)^7+175p_D^4(1-p_D)^6+246p_D^5(1-p_D)^5+210p_D^6(1-p_D)^4+121p_D^7(1-p_D)^3+45p_D^8(1-p_D)^2+10p_D^9(1-p_D)+p_D^{10}$
11	$10p_D^2(1-p_D)^9+81p_D^3(1-p_D)^8+260p_D^4(1-p_D)^7+440p_D^5(1-p_D)^6+463p_D^6(1-p_D)^5+328p_D^7(1-p_D)^4+165p_D^8(1-p_D)^3+55p_D^9(1-p_D)^2+11p_D^{10}(1-p_D)+p_D^{11}$
12	$11p_D^2(1-p_D)^{10}+100p_D^3(1-p_D)^9+369p_D^4(1-p_D)^8+736p_D^5(1-p_D)^7+917p_D^6(1-p_D)^6+791p_D^7(1-p_D)^5+495p_D^8(1-p_D)^4+220p_D^9(1-p_D)^3+66p_D^{10}(1-p_D)^2+12p_D^{11}(1-p_D)+p_D^{12}$

Counting mutually exclusive events is a difficult task. A closed form solution for determining the cumulative probability of detection for 2 consecutive hits out of N looks is given as[3].

$$P_{CD2,2}=1-\sum_{i=0}^{k} C_i p_D^{\,i}(1-p_D)^{N-i} \qquad (10)$$

where

$$C_i=\binom{N+1-i}{i}$$

and k is the index at N+1-2i=0 or 1. Table 2-4 lists the coefficient C_i for N=2 to 12 and gives the required value of p_D for P_{CD} to be 0.95. Figure 2-9 and Figure 2-10 show the cumulative probability of detection(as a function of p_D) and the improvement factor respectively for N=3,6,9,and 12. Also shown in Figure 2-9 are the Monte Carlo results using 10,000 points.

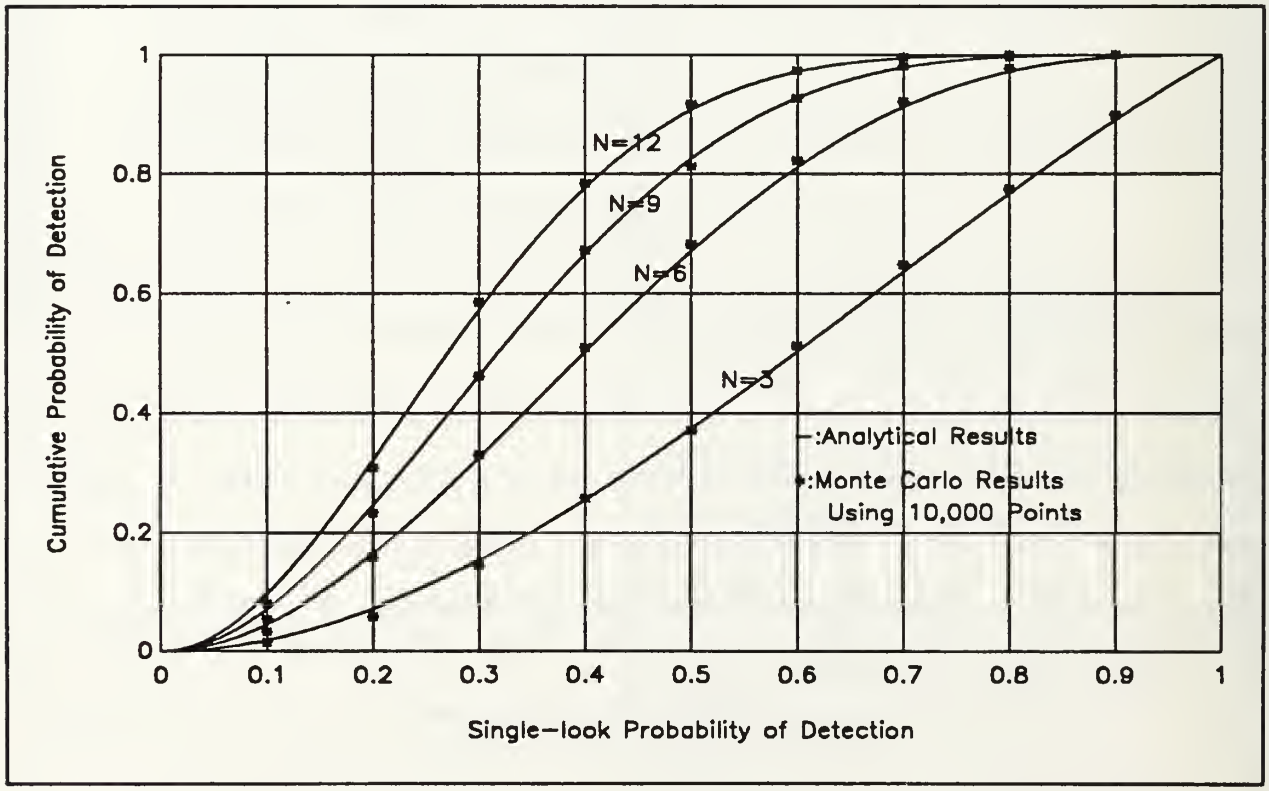

Figure 2-9 Cumulative Probability of detection for 2 Consecutive Hits out of N Looks($P_{CD,2,2}$)

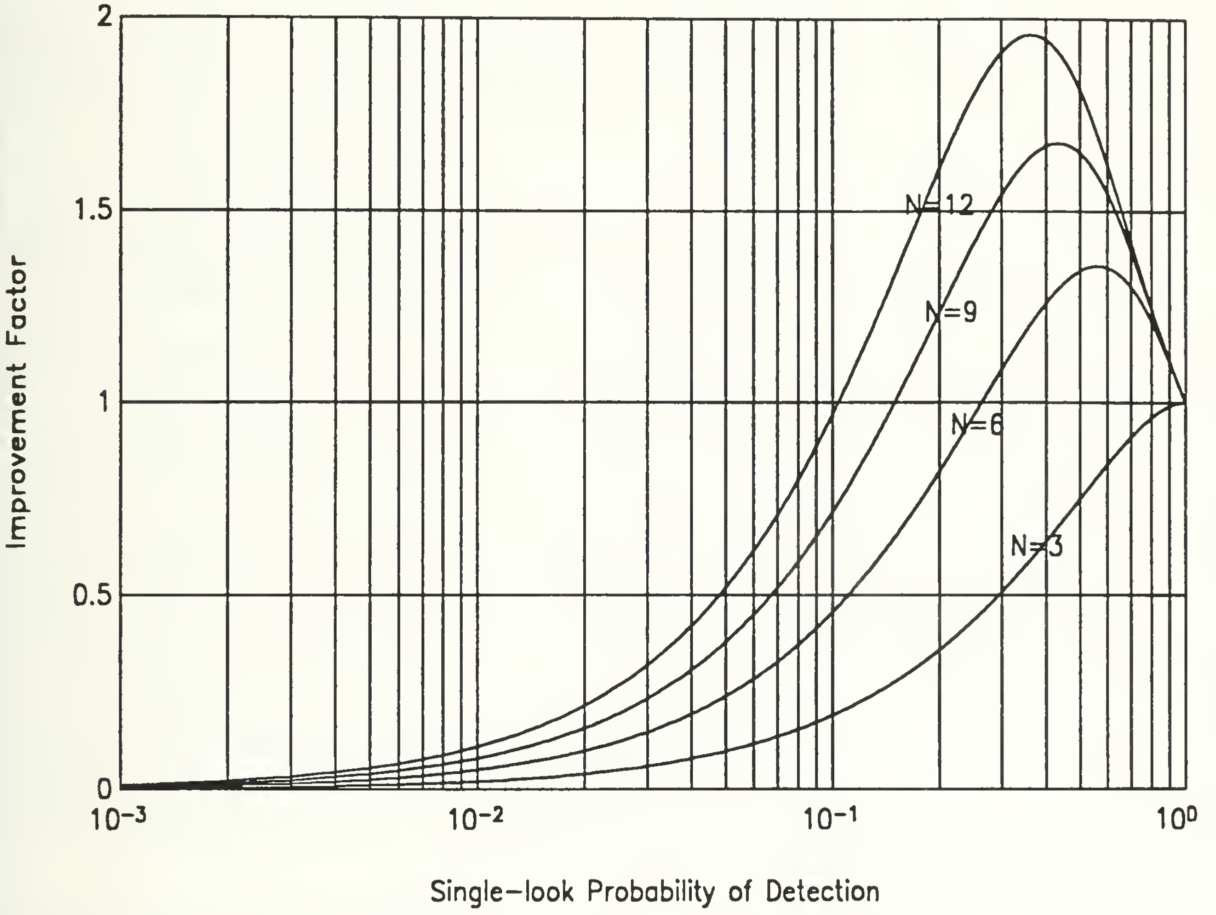

Figure 2-10 Improvement Factor for 2 Consecutive Hits out of N Looks

TABLE 2-4 COEFFICIENT C_i FOR 2 CONSECUTIVE HITS OUT OF N LOOKS[3]

N	C_i	p_D for P_{CD}=0.95
2	1,2	0.974679
4	1,3,1	0.952178
4	1,4,3	0.864650
5	1,5,6,1	0.812871
4	1,6,10,4	0.755121
7	1,7,15,10,1	0.710270
8	1,8,21,20,5	0.670160
4	1,9,28,35,15,1	0.635855
10	1,10,36,56,35,6	0.605714
11	1,11,45,84,70,21,1	0.670160
12	1,12,55,120,126,56, 7	0.555538

For example if 2 consecutive hits out of 7 looks are considered, the expression for the cumulative probability of detection is $P_{CD}=6p_D^2(1-p_D)^5+25p_D^3(1-p_D)^4+34p_D^4(1-p_D)^3+21p_D^5(1-p_D)^2+7p_D^6(1-p_D)+p_D^7$ (from Table 2-3). Equation (10) can be expressed as

$$P_{CD2,2}=1-\sum_{i=0}^{k}\binom{8-i}{i}p_D^{\,i}(1-p_D)^{N-i} \qquad (11)$$

and gives the same result as can easily be verified.

In a similar manner, the analytical results for the cumulative probability of detection using 3 consecutive hits out of N looks can be found and are listed in Table 2-5.

TABLE 2-5 3 CONSECUTIVE HITS OUT OF N LOOKS

N	$P_{CD3,3}$
3	p_D^3
4	$2p_D^3(1-p_D)+p_D^4$
5	$3p_D^3(1-p_D)^2+4p_D^4(1-p_D)+p_D^5$
6	$4p_D^3(1-p_D)^3+9p_D^4(1-p_D)^2+6p_D^5(1-p_D)+p_D^6$
7	$5p_D^3(1-p_D)^4+16p_D^4(1-p_D)^3+18p_D^5(1-p_D)^2+7p_D^6(1-p_D)+p_D^7$
8	$6p_D^3(1-p_D)^5+25p_D^4(1-p_D)^4+40p_D^5(1-p_D)^3+27p_D^6(1-p_D)^2+8p_D^7(1-p_D)+p_D^8$
9	$7p_D^3(1-p_D)^6+36p_D^4(1-p_D)^5+75p_D^5(1-p_D)^4+74p_D^6(1-p_D)^3+36p_D^7(1-p_D)^2+9p_D^8(1-p_D)+p_D^9$

10	$8p_D^3(1-p_D)^7+48p_D^4(1-p_D)^6+126p_D^5(1-p_D)^5+165p_D^6(1-p_D)^4+116p_D^7(1-p_D)^3+45p_D^8(1-p_D)^2+10p_D^9(1-p_D)+p_D^{10}$
11	$9p_D^3(1-p_D)^8+63p_D^4(1-p_D)^7+195p_D^5(1-p_D)^6+323p_D^6(1-p_D)^5+298p_D^7(1-p_D)^4+164p_D^8(1-p_D)^3+55p_D^9(1-p_D)^2+11p_D^{10}(1-p_D)+p_D^{11}$
12	$10p_D^3(1-p_D)^9+81p_D^4(1-p_D)^8+282p_D^5(1-p_D)^7+550p_D^6(1-p_D)^6+666p_D^7(1-p_D)^5+481p_D^8(1-p_D)^4+220p_D^9(1-p_D)^3+66p_D^{10}(1-p_D)^2+12p_D^{11}(1-p_D)+p_D^{12}$

$P_{CD3,3}$(cumulative probability of detection for 3 consecutive hits out of N looks) may again be found by using (10) as

$$P_{CD3,3}=1-\sum_{j=0}^{k} C_j p_D^{\,j}(1-p_D)^{N-j} \qquad (12)$$

where C_j is found in Table 2-6 and k is one less than the number of C_j entries for each N. Figure 2-11 and Figure 2-12 show the cumulative probability of detection and improvement factor respectively as a function of p_D.

TABLE 2-6 COEFFICIENT C_j FOR 3 CONSECUTIVE HITS OUT OF N LOOKS[3]

N	C_j	p_D for $P_{CD}=0.95$
3	1,3,3	0.983043
4	1,4,6,2	0.876475
6	1,5,10,7,1	0.955506
6	1,6,15,16,6	0.902389
7	1,7,21,30,19,3	0.876475
6	1,8,28,50,45,16,1	0.845852
9	1,9,36,77,90,51,10	0.815674
10	1,10,45,112,161,126,45,4	0.767634
11	1,11,55,156,166,266,141,30,1	0.767634
12	1,12,66,210,414,504,357,126,15	0.746331

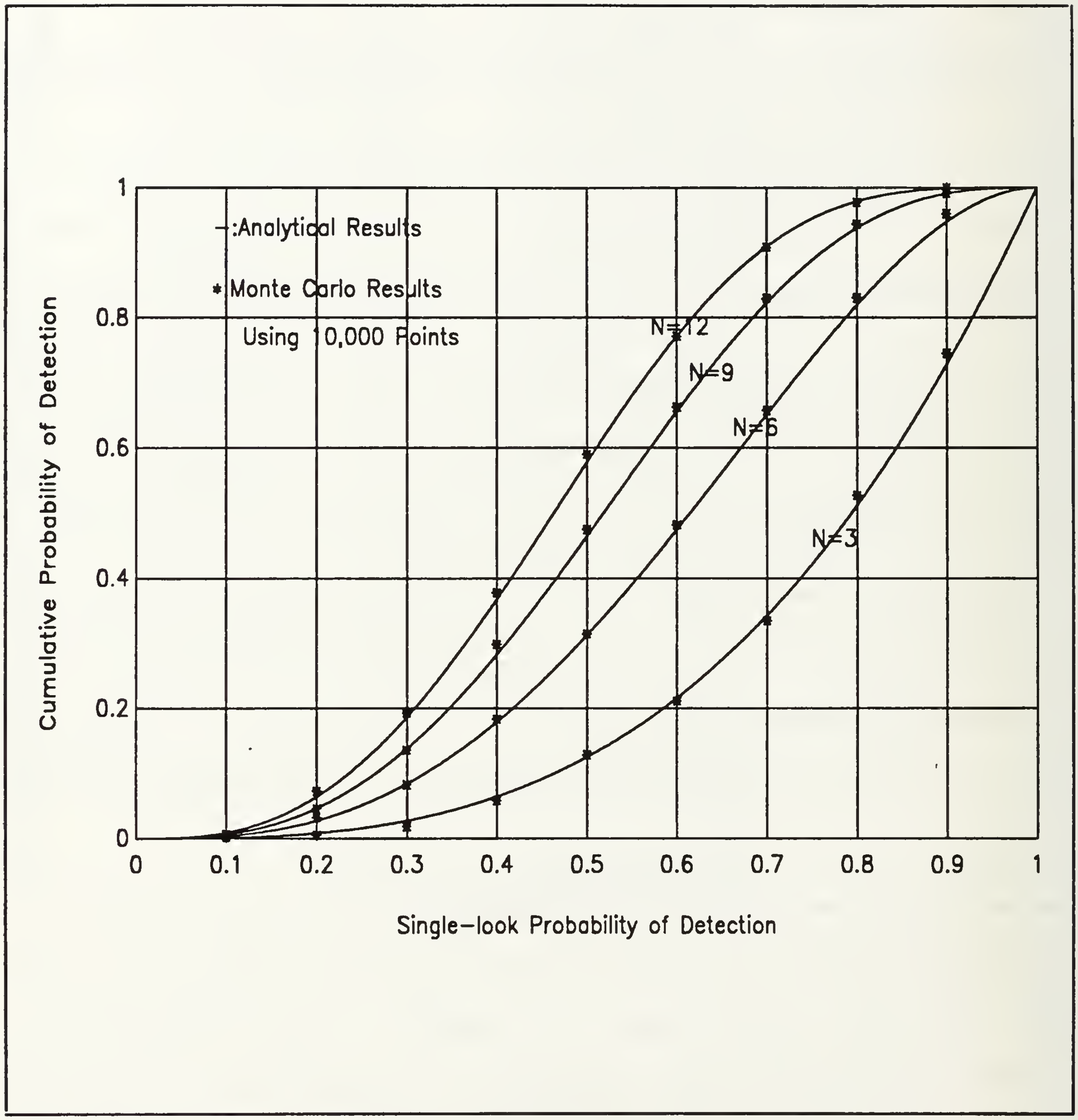

Figure 2-11 Cumulative Probability of Detection for 3 Consecutive Hits out of N Looks($P_{CD,3,3}$)

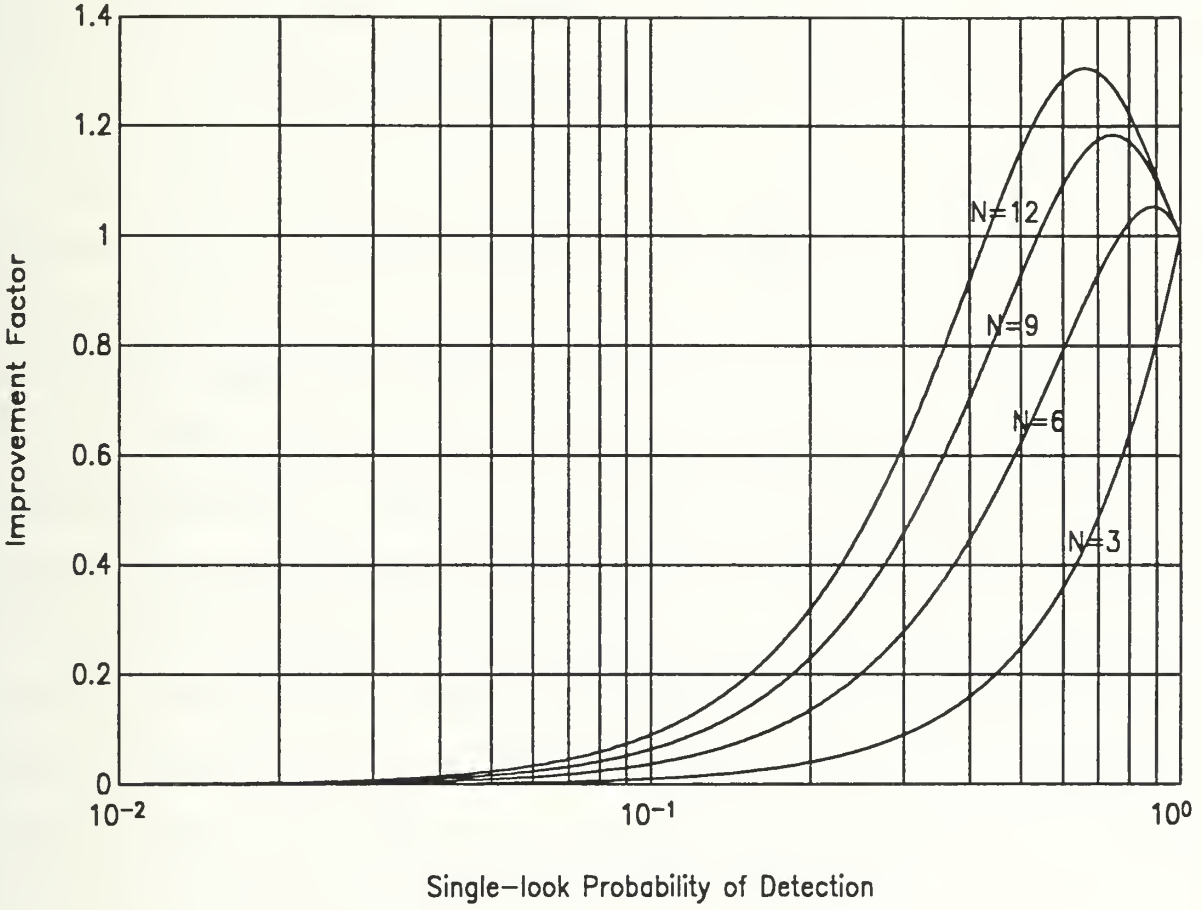

Figure 2-12 Improvement Factor for 3 Consecutive Hits out of N Looks

C. CALCULATION OF R_{90} FROM THE BLIP SCAN RATIO

Acceptance testing of acquisition radars normally involves the checking of a specification on R_{90}, the range such that the cumulative probability of detection of an approaching target is 0.90. The usual procedure for determining R_{90} is to fly several target approaches to the radar to provide an empirical blip-scan ratio, the single-scan probability $p_D(R)$ of detection.
Then R_{90} solves

$$1-\prod_{R_i \geq R_{90}} [1-p_D(R_i)] = 0.90 \qquad (13)$$

where R_i represents the target range at each radar scan. The blip scan data predates the widespread use of the term probability of detection and came about by the manner in which the performance of ground-based search radars were checked. An aircraft would be flown on a radial course and on each scan of the antenna it would be recorded whether or not a target blip had been detected on the radar display. This was repeated many times until sufficient data was obtained to compute *as a function of range*, the ratio of the average number of scans the target was seen at a particular range (blips) to the total number of times it could have been seen(blip scan ratio).

Occasionally the range where the prescribed detection probability is reached is less than specified. This can occur due to a deficiency in system performance, variation due to a finite number of samples, or variations in test conditions. As is known from observing games of chance, the frequency of wins does not follow the probability of winning over short runs of samples. If it did, there would be little incentive to gamble. A run of wins can occur and the winner is lucky. Similarly in measuring blip scan, a run of hits can occur and system performance is considered outstanding. However, it is equally likely that a run of misses can occur, solely due to chance. At this time the tendency is to declare unsatisfactory performance.

When the result of each scan is either a hit or a miss, such observations are known as Bernoulli trials and are characterized by the binomial distribution(see section II-B). These functions allow us to calculate the probability of obtaining M hits out of N looks when the single-look probability of a hit is p_D. However, The inverse problem can also be of concern. That is given that we have M hits out of N looks, determine the underlining probability of success. If we had an infinite number of trials, then $p_D=M/N$. Since the number of trials is limited we can only determine the range of probabilities that can give us these results[4]. Furthermore the probability of the true value lying outside this range is finite and calculable. It is termed the level of significance of the test. The smaller the level, the more we are sure of the value being contained in the range. The probability of the value lying inside the range is known as the confidence coefficient and is equal to one minus the level of significance[5].

D. CALCULATION OF R_{90} FROM DIRECT OBSERVATION

Calculation of R_{90} from the range gated blip scan ratio has drawbacks:

1) Dedicated flights are required
2) Special instrumentation is required to record blip-scan data
3) Equation (13) assumes the occurrences of blips (detections) on different scans are independent events, which may not be valid(e.g., displayed signal may be based on a M out of N rule).

It is often the case, especially in military acceptance testing, that initial detection range data will accumulate in the course of various test operations. This data can be used to provide information - specifically, a confidence bound - on R_{90} as follows. Let the observed initial detection ranges (obtained for target types and closure speeds relevant to the R_{90} specification) be ordered as

$$X_{(1)} \leq X_{(2)} \leq X_{(3)} \ldots \leq X_{(n)}$$

Note that these are detection ranges. By the definition of R_{90}, the probability of detecting an approaching target on one or more scans at ranges greater than or equal to R_{90} is 0.90. That is, the probability of an initial detection at a range greater than or equal to R_{90} is 0.90.

The probability of k or more initial detection ranges being smaller than R_{90} is the probability of k or more events, each with probability 0.10, occurring in N independent trials:

$$P_r(x_{(k)} < R_{90}) = \sum_{i=k}^{n} \binom{n}{i} (0.1)^{i} (0.9)^{n-i} \tag{14}$$

Also notice that $x_{(k)}$ will be a lower $(1-\alpha)$ confidence bound on R_{90} if

$$P_r(x_{(k)} < R_{90}) \geq 1-\alpha \tag{15}$$

Consequently, if we hold k fixed, then $x_{(k)}$ is a lower $(1-\alpha)$ confidence bound for R_{90} whenever the sample size n is large enough that the sum in (14) exceeds $1-\alpha$. In a similar manner R_{60}-R_{95} can be found. Minimum values of $x_{(1)}, x_{(2)}, x_{(3)}$ and corresponding values of $1-\alpha$ are given in Table 2-7. Two-sided confidence bounds can also be constructed using

$$P_r(x_{(k)} < R_{90} \leq x_{(l)}) = \sum_{i=k}^{i=l} \binom{n}{l} (0.1)^{i} (0.9)^{n-i} \tag{16}$$

where $x_{(k)} < x_{(l)}$. This method has the advantages that no special instrumentation is required and no assumptions on the radar internal processing have been made. That is, R_{60}-R_{95} can refer to any definition of "detection" -single blip, double blip, M out of N, or even track initiation[6].

TABLE 2-7 MINIMUM NUMBER OF DETECTIONS NEEDED TO STATE $x_{(k)}$ IS A LOWER (1-α) CONFIDENCE BOUND

R_{60}

1-α	$x_{(1)}$	$x_{(2)}$	$x_{(3)}$
0.50	2	4	7
0.60	2	5	8
0.70	4	4	8
0.80	4	7	14
0.90	5	5	12
0.95	6	10	14
0.99	10	14	18

R_{65}

1-α	$x_{(1)}$	$x_{(2)}$	$x_{(3)}$
0.50	2	5	8
0.60	4	4	8
0.70	8	7	10
0.90	8	8	12
0.90	6	10	14
0.95	7	12	16
0.99	11	16	21

R_{70}

$1-\alpha$	$x_{(1)}$	$x_{(2)}$	$x_{(3)}$
0.60	8	6	9
0.60	3	7	10
0.70	3	8	12
0.80	5	8	14
0.90	7	12	10
0.95	9	14	19
0.99	13	20	25

R_{75}

$1-\alpha$	$x_{(1)}$	$x_{(2)}$	$x_{(3)}$
0.50	3	7	11
0.60	4	8	12
0.70	5	10	14
0.80	6	11	16
0.90	9	15	20
0.95	11	18	23
0.99	17	24	31

R_{80}

$1-\alpha$	$x_{(1)}$	$x_{(2)}$	$x_{(3)}$
0.60	4	9	14
0.60	5	10	15
0.70	8	12	18
0.80	8	10	21
0.90	10	19	25
0.95	14	22	30
0.99	21	31	39

R_{85}

$1-\alpha$	$x_{(1)}$	$x_{(2)}$	$x_{(3)}$
0.50	5	11	18
0.60	6	19	21
0.70	8	16	24
0.80	10	19	25
0.90	15	25	34
0.95	19	30	40
0.99	29	42	53

R_{90}

$1-\alpha$	$X_{(1)}$	$X_{(2)}$	$X_{(3)}$
0.90	7	17	27
0.60	9	20	31
0.70	12	24	36
0.60	14	24	62
0.90	22	38	52
0.95	29	46	61
0.99	44	54	81

R_{95}

$1-\alpha$	$X_{(1)}$	$x_{(2)}$	$x_{(3)}$
0.90	14	34	54
0.60	14	14	62
0.70	24	14	72
0.60	32	59	85
0.90	45	77	105
0.95	59	93	124
0.99	90	130	165

III. CUMULATIVE PROBABILITY OF DETECTION USING M OUT OF N WITH AT LEAST X CONSECUTIVE HITS

In the previous chapter, several common binary integration strategies were presented and their improvement over the single look probability of detection discussed. This chapter derives closed form expressions for a new binary integration algorithm, M hits out of N looks with at least x<M consecutive hits.

If one chooses to require 3 hits out of 4 looks with at least 2 hits consecutive, Table 3-1 lists all possible outcomes for four looks at a target.

TABLE 3-1 3 OUT OF 4 WITH AT LEAST 2 CONSECUTIVE HITS

Row Number	Looks #				Probabi-lity of Detecti-on	Output
	1	2	3	4		
0	H	H	H	H	p_D^4	1
1	H	H	H	M	$p_D^3(1-p_D)$	1

2	H	H	M	H	$p_D^3(1-p_D)$	1
3	H	H	M	M	0	0
4	H	M	H	H	$p_D^3(1-p_D)$	1
5	H	M	H	M	0	0
6	H	M	M	H	0	0
7	H	M	M	M	0	0
8	M	H	H	H	$p_D^3(1-p_D)$	1
9	M	H	H	M	0	0
10	M	H	M	H	0	0
11	M	H	M	M	0	0
12	M	M	H	H	0	0
13	M	M	H	M	0	0
14	M	M	M	H	0	0
15	M	M	M	M	0	0
$P_{CD}=4P_D^3(1-p_D)+p_D^4$						

Note that only in row 0,1,2,4 and 8 are there 3 out of 4 with at least 2 consecutive hits. If p_D is the probability of a hit on a single look, then P_{CD} for this case may be found by summing the probabilities for the successful events. In this case $P_{CD} = 4p_D^3(1 p_D)+p_D^4$.

A. CLOSED FORM EXPRESSION FOR CUMULATIVE PROBABILITY OF DETECTION

Table 3-2 gives the analytical results for the cumulative probability of detection using 3 hits out of N with at least 2 consecutive.

TABLE 3-2 3 OUT OF N WITH AT LEAST 2 CONSECUTIVE HITS

N	$P_{CD3,2}$
4	$4p_D^3(1-p_D)+p_D^4$
5	$9p_D^3(1-p_D)^2+5p_D^4(1-p_D)+p_D^5$
6	$16p_D^3(1-p_D)^3+15p_D^4(1-p_D)^2+6p_D^5(1-p_D)+p_D^6$
7	$25p_D^3(1-p_D)^4+34p_D^4(1-p_D)^3+21p_D^5(1-p_D)^2+7p_D^6(1-p_D)+p_D^7$
8	$36p_D^3(1-p_D)^5+65p_D^4(1-p_D)^4+56p_D^5(1-p_D)^3+28p_D^6(1-p_D)^2+8p_D^7(1-p_D)+p_D^8$

9	$49p_D^3(1-p_D)^6+110p_D^4(1-p_D)^5+126p_D^5(1-p_D)^4+84p_D^6(1-p_D)^3+36p_D^7(1-p_D)^2+9p_D^8(1-p_D)+p_D^9$
10	$64p_D^3(1-p_D)^7+175p_D^4(1-p_D)^6+246p_D^5(1-p_D)^5+210p_D^6(1-p_D)^4+121p_D^7(1-p_D)^3+45p_D^8(1-p_D)^2+10p_D^9(1-p_D)+p_D^{10}$
11	$81p_D^3(1-p_D)^8+260p_D^4(1-p_D)^7+440p_D^5(1-p_D)^6+463p_D^6(1-p_D)^5+328p_D^7(1-p_D)^4+165p_D^8(1-p_D)^3+55p_D^9(1-p_D)^2+11p_D^{10}(1-p_D)+p_D^{11}$
12	$100p_D^3(1-p_D)^9+369p_D^4(1-p_D)^8+736p_D^5(1-p_D)^7+917p_D^6(1-p_D)^6+791p_D^7(1-p_D)^5+495p_D^8(1-p_D)^4+220p_D^9(1-p_D)^3+66p_D^{10}(1-p_D)^2+12p_D^{11}(1-p_D)+p_D^{12}$

A pattern for the cumulative probability of detection may be found from this table and results in the closed form expression

$$P_{CD3,2}=P_{CD2,2}-S_1p_D^{M-1}(1-p_D)^{N-M+1} \qquad (17)$$

where $P_{CD2,2}$ is defined in (10) and S_1 is defined in Table 3-3.

TABLE 3-3 S_n FOR M OUT OF N WITH AT LEAST 2 CONSECUTIVE HITS

N	S_4	S_4	S_9	S_4	S_9	S_4	S_7	S_4	S_9	S_{10}	S_{11}
3	2	1									
6	3	1	1								
5	1	9	5	1							
6	5	15	15	9	1						
7	9	25	34	21	9	1					
5	7	36	65	64	21	9	8				
5	8	64	110	126	64	36	9	1			
10	9	64	175	246	210	121	45	10	1		
11	10	21	260	440	463	328	165	65	10	1	
12	11	100	369	763	917	791	495	220	66	12	1

The cumulative probability of detection and improvement factor as a function of p_D are shown in Figure 3-1 and Figure 3-2 respectively. These figures can be compared with Figure 2-11 and 2-12(3 consecutive hits out of N looks). This comparison shows that by relaxing the demands on the required number of consecutive hits(i.e.,from 3 to 2) a dramatic increase in detection probability results. Continuing on,

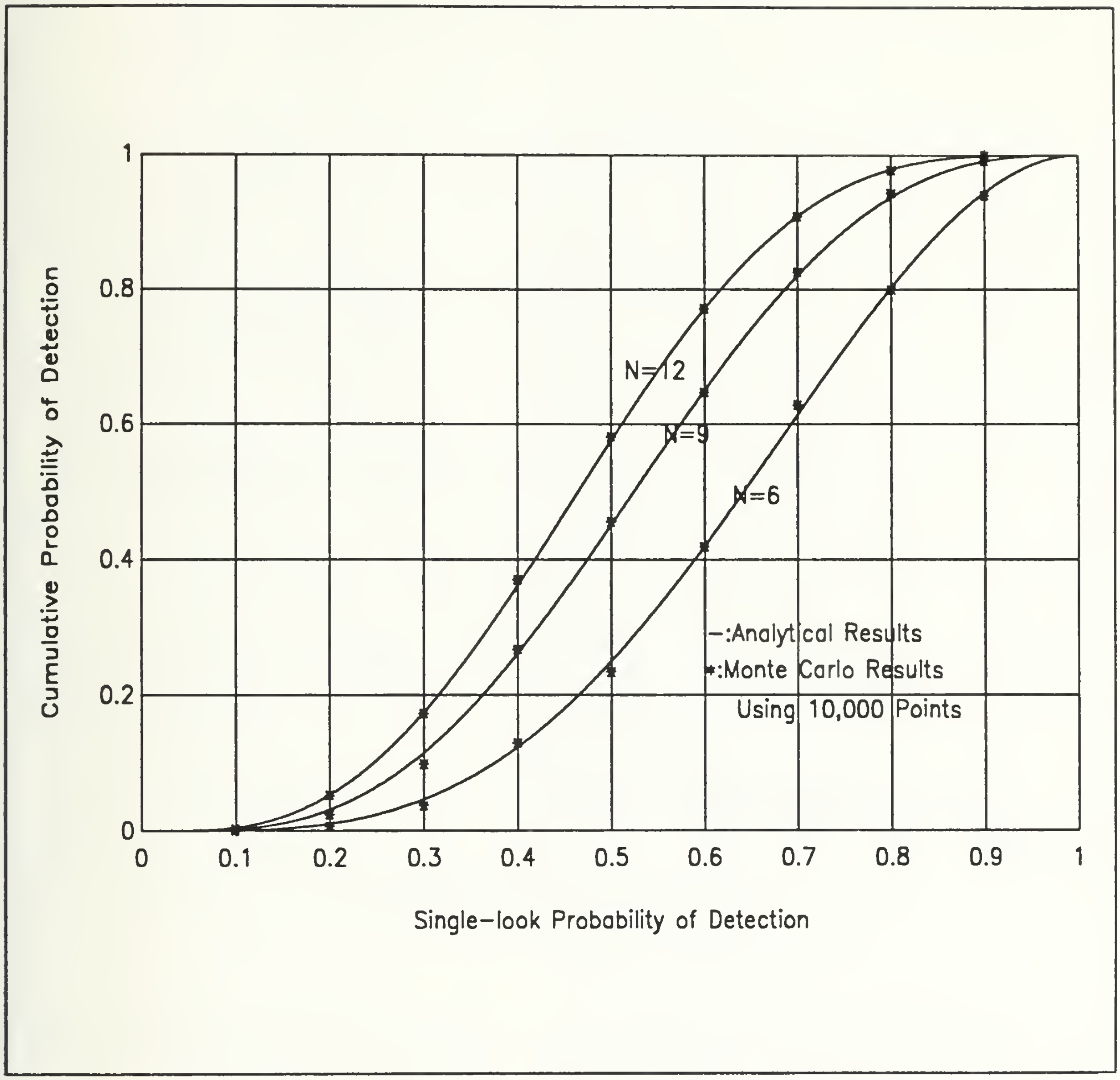

Figure 3-1 Cumulative Probability of Detection for 3 out of N with at Least 2 Consecutive Hits

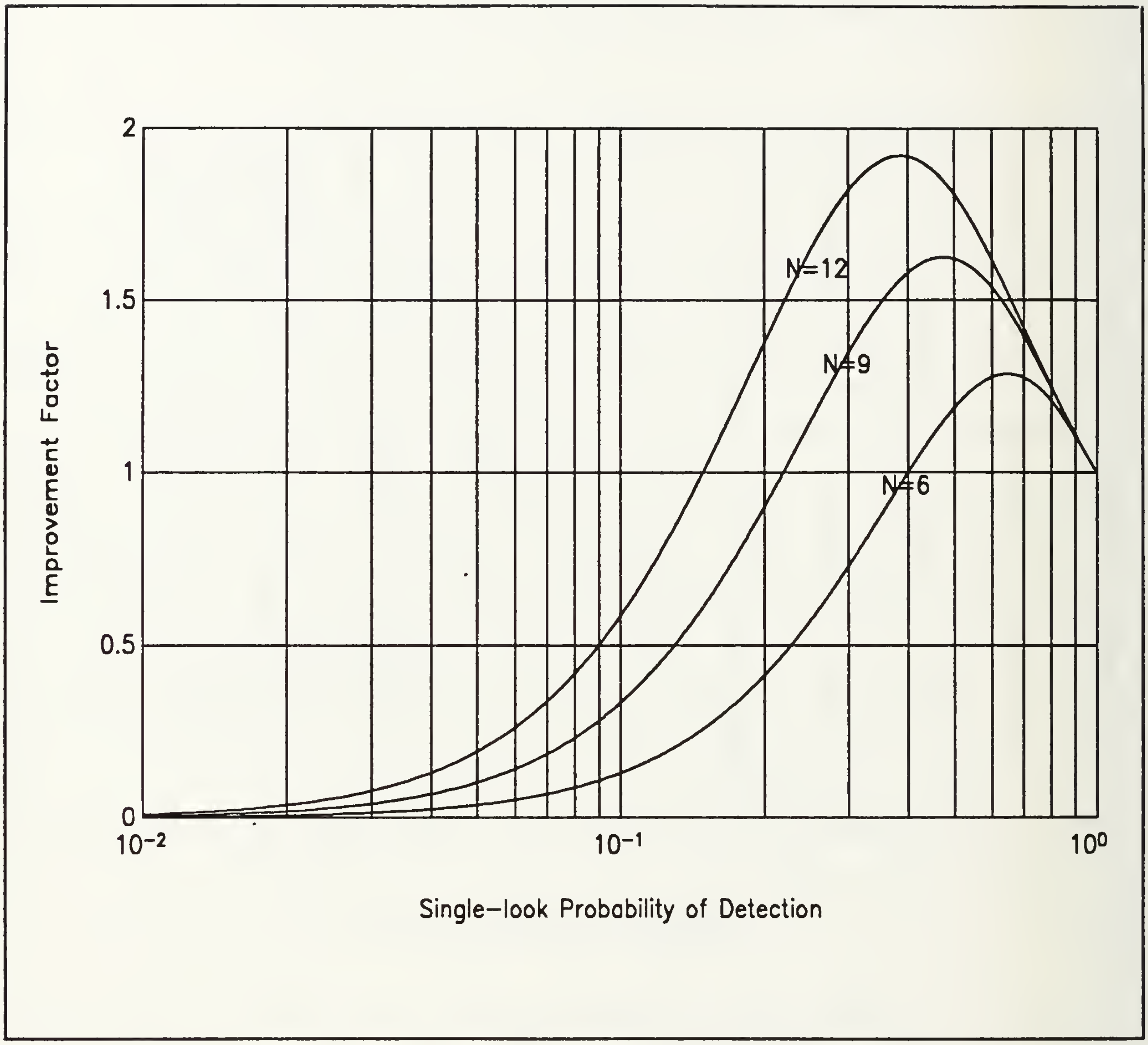

Figure 3-2 Improvement Factor for 3 out of N with at Least 2 Consecutive Hits

Table 3-4 gives analytical results for the cumulative probability of detection($P_{CD4,2}$) using 4 out of N with at least 2 consecutive hits for N = 5 to 12.

TABLE 3-4 4 OUT OF N WITH AT LEAST 2 CONSECUTIVE HITS

N	$P_{CD4,2}$
5	$5p_D^4(1-p_D)+p_D^5$
6	$15p_D^4(1-p_D)^2+6p_D^5(1-p_D)+p_D^6$
8	$34p_D^4(1-p_D)^3+21p_D^5(1-p_D)^2+7p_D^6(1-p_D)+p_D^7$
8	$65p_D^4(1-p_D)^4+56p_D^5(1-p_D)^3+28p_D^6(1-p_D)^2+8p_D^7(1-p_D)+p_D^8$
9	$110p_D^4(1-p_D)^5+126p_D^5(1-p_D)^4+84p_D^6(1-p_D)^3+36p_D^7(1-p_D)^2+9p_D^8(1-p_D)+p_D^9$
10	$175p_D^4(1-p_D)^6+246p_D^5(1-p_D)^5+210p_D^6(1-p_D)^4+121p_D^7(1-p_D)^3+45p_D^8(1-p_D)^2+10p_D^9(1-p_D)+p_D^{10}$
11	$260p_D^4(1-p_D)^7+440p_D^5(1-p_D)^6+463p_D^6(1-p_D)^5+328p_D^7(1-p_D)^4+165p_D^8(1-p_D)^3+55p_D^9(1-p_D)^2+11p_D^{10}(1-p_D)+p_D^{11}$

12	$369p_D^4(1-p_D)^8+736p_D^5(1-p_D)^7+917p_D^6(1-p_D)^6+791p_D^7(1-p_D)^5+495p_D^8(1-p_D)^4+220p_D^9(1-p_D)^3+66p_D^{10}(1-p_D)^2+12p_D^{11}(1-p_D)+p_D^{12}$

A closed form expression can be extracted in the form

$$P_{CD4,2}=P_{CD3,2}-S_2 p_D^{M-1}(1-p_D)^{N-M+1} \qquad (18)$$

where $P_{CD3,2}$ is defined (17) and where S_2 is defined in Table 3-3. The cumulative probability of detection as a function of p_D and the corresponding improvement factor are shown in Figure 3-3 and Figure 3-4 respectively.

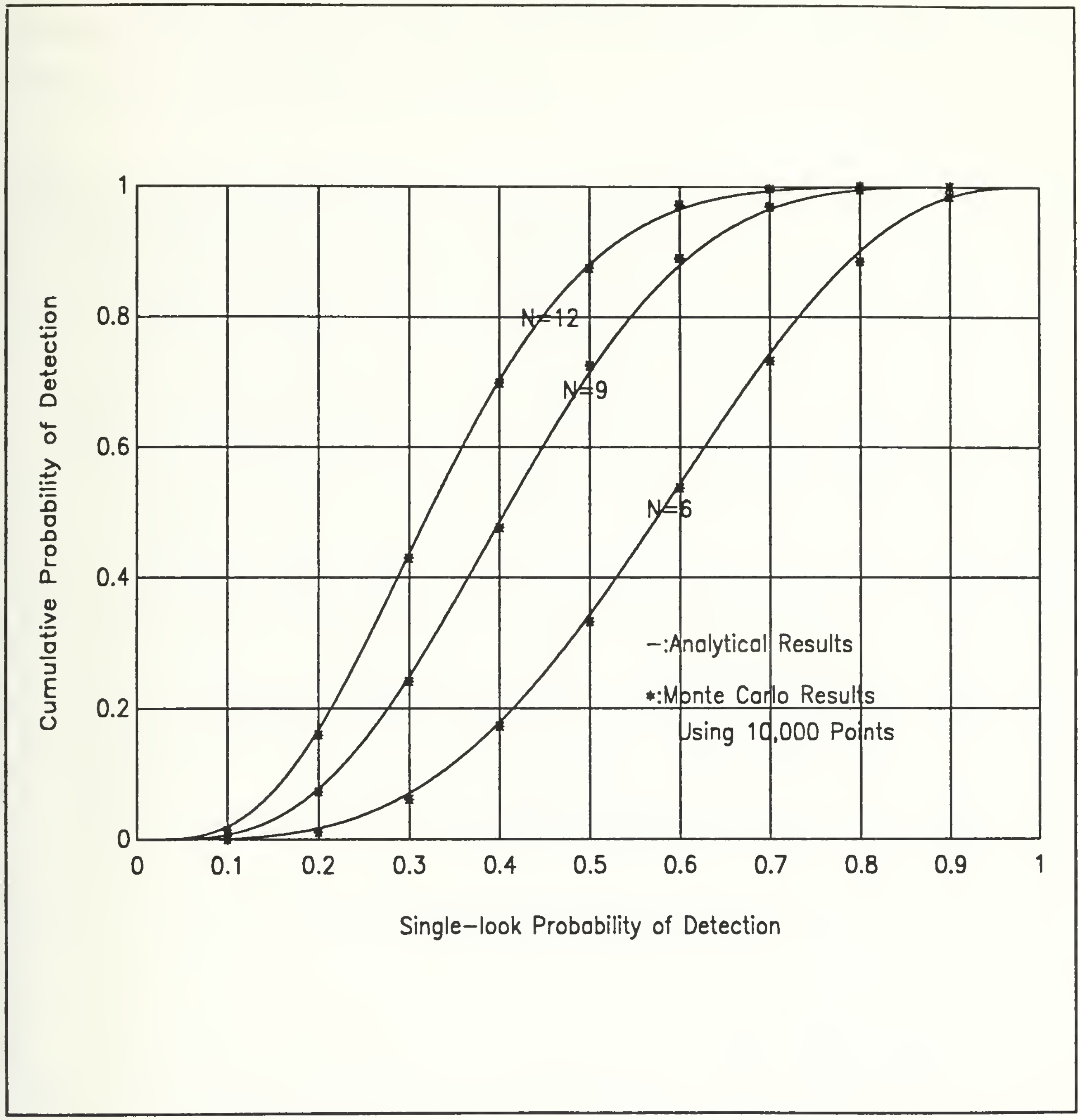

Figure 3-3 Cumulative Probability of Detection for 4 out of N with at Least 2 Consecutive Hits

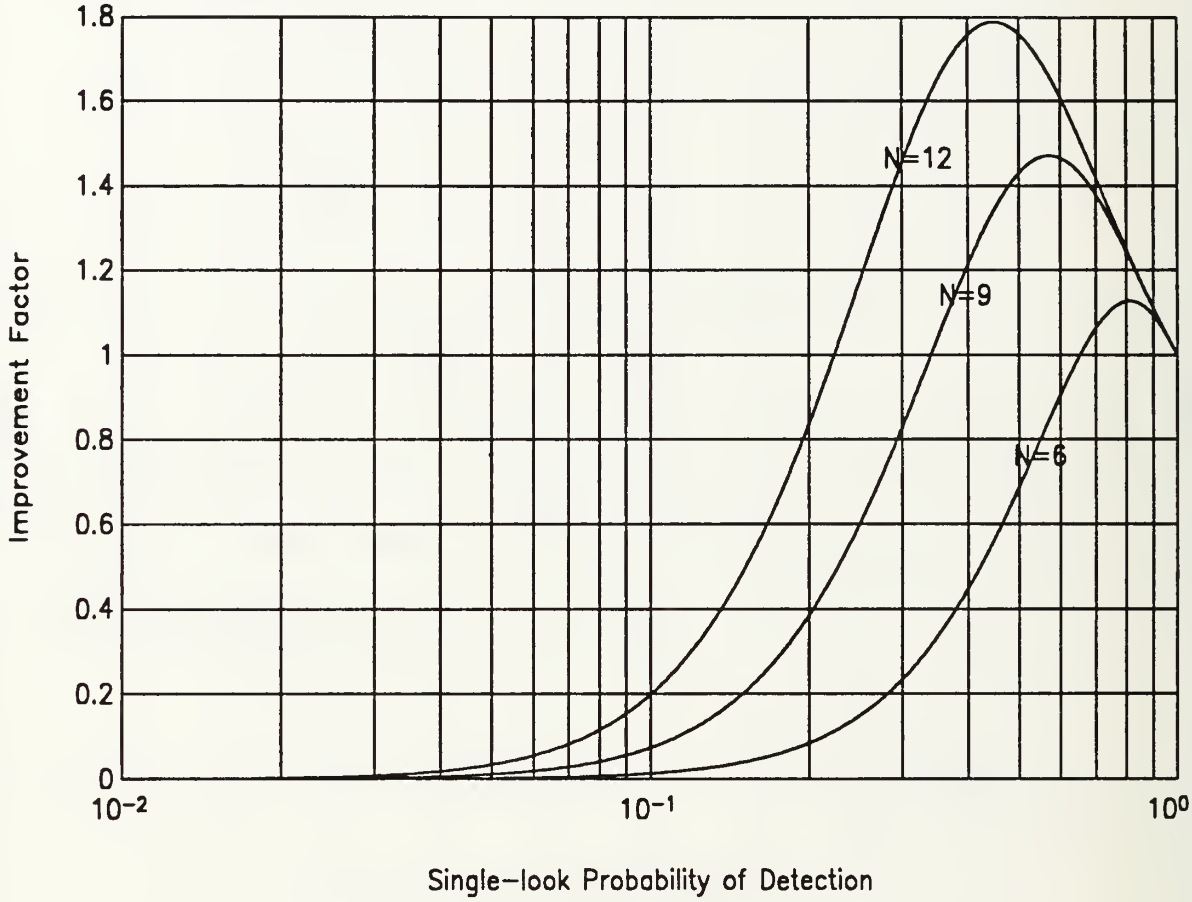

Figure 3-4 Improvement Factor for 4 out of N with at Least 2 Consecutive Hits

Table 3-5 gives the analytical results for the cumulative probability of detection($P_{CD5,2}$) for 5 out of N with at least 2 consecutive hits for N = 6 to 12.

TABLE 3-5 5 OUT OF N WITH AT LEAST 2 CONSECUTIVE HITS

N	$P_{CD5,2}$
6	$6p_D^5(1-p_D)+p_D^6$
7	$21p_D^5(1-p_D)^2+7p_D^6(1-p_D)+p_D^7$
9	$56p_D^5(1-p_D)^3+28p_D^6(1-p_D)^2+8p_D^7(1-p_D)+p_D^8$
9	$126p_D^5(1-p_D)^4+84p_D^6(1-p_D)^3+36p_D^7(1-p_D)^2+9p_D^8(1-p_D)+p_D^9$
10	$246p_D^5(1-p_D)^5+210p_D^6(1-p_D)^4+121p_D^7(1-p_D)^3+45p_D^8(1-p_D)^2+10p_D^9(1-p_D)+p_D^{10}$
11	$440p_D^5(1-p_D)^6+463p_D^6(1-p_D)^5+328p_D^7(1-p_D)^4+165p_D^8(1-p_D)^3+55p_D^9(1-p_D)^2+11p_D^{10}(1-p_D)+p_D^{11}$
12	$736p_D^5(1-p_D)^7+917p_D^6(1-p_D)^6+791p_D^7(1-p_D)^5+495p_D^8(1-p_D)^4+220p_D^9(1-p_D)^3+66p_D^{10}(1-p_D)^2+12p_D^{11}(1-p_D)+p_D^{12}$

The closed form expression here is

$$P_{CD5,2}=P_{CD4,2}-S_3 p_D^{M-1}(1-p_D)^{N-M+1} \tag{19}$$

where $P_{CD4,2}$ is defined by (18) and where S_3 is defined in Table 3-3. The cumulative probability of detection and improvement factor are also shown in Figure 3-5 and 3-6.

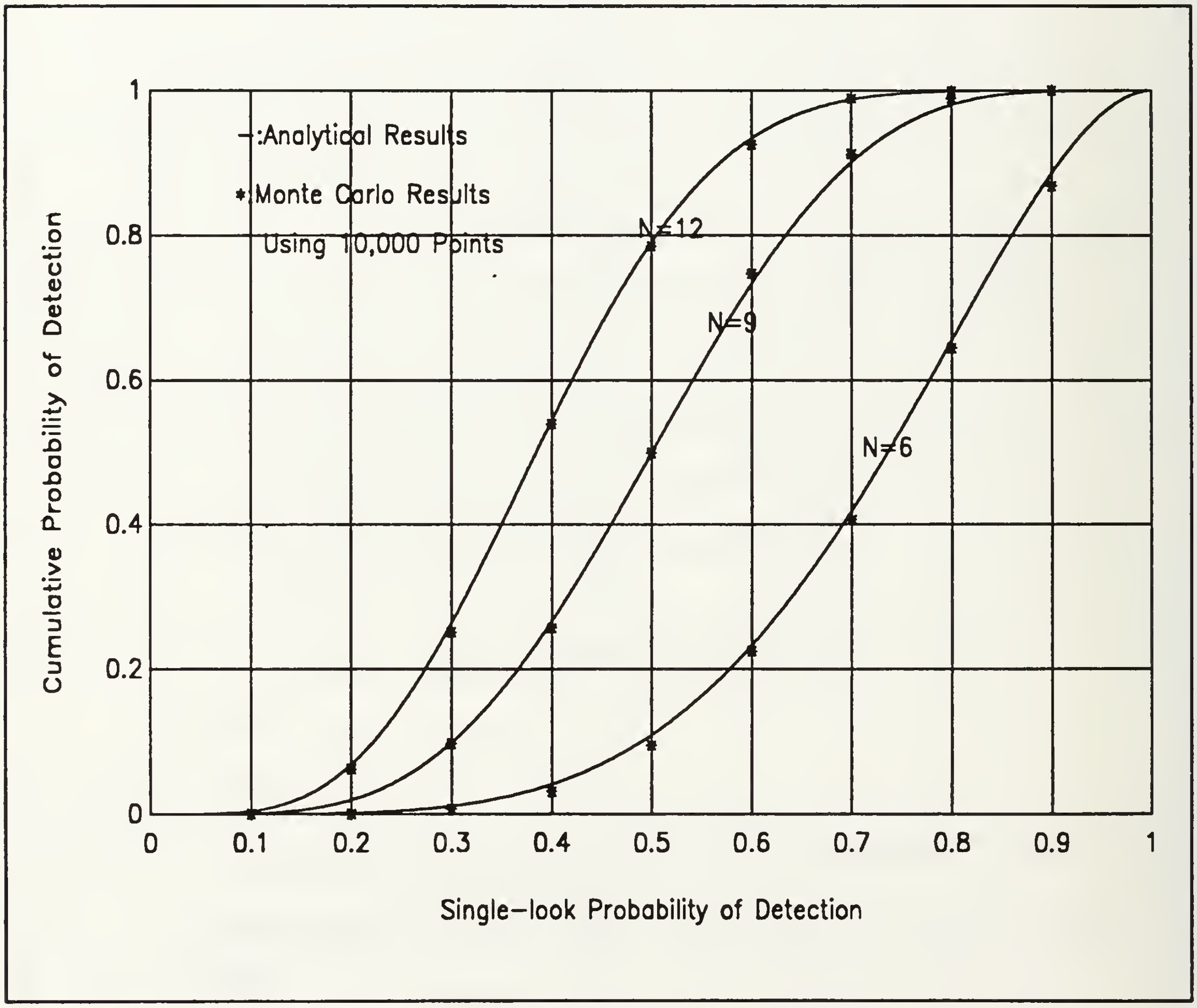

Figure 3-5 Cumulative Probability of Detection for 5 out of N with at Least 2 Consecutive Hits

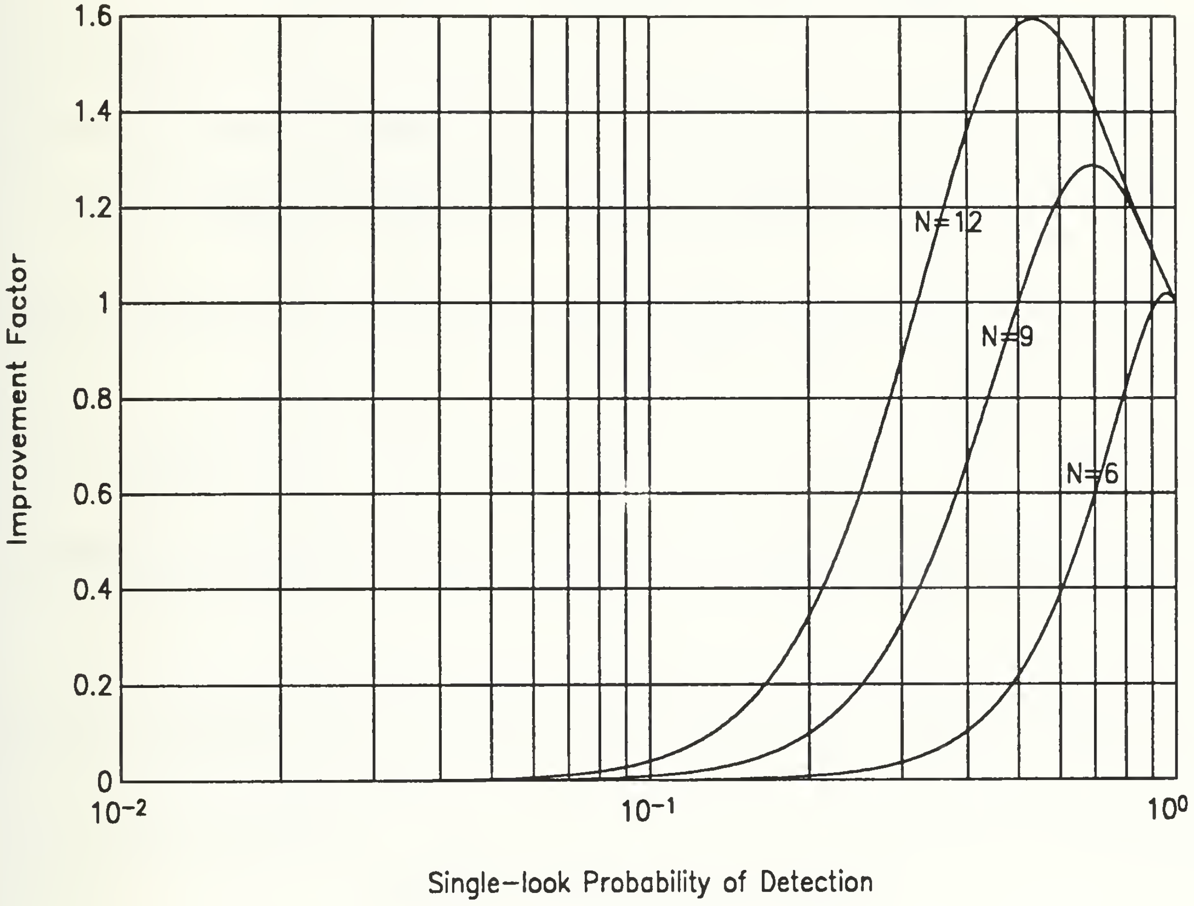

Figure 3-6 Improvement Factor for 5 out of N with at Least 2 Consecutive Hits

From the (17),(18) and (19), one expression for M out of N with at least 2 consecutive hits can be found :

$$P_{CD(M),2}=P_{CD(M-1),2}-S_{M-2}p_D^{M-1}(1-p_D)^{N-M+1} \tag{20}$$

Equation (20) can be used as follows. For example, if 3 out of 9 with at least 2 consecutive hits are considered, then

$$P_{CD3,2}=P_{CD2,2}-S_1 P_D^2(1-P_D)^7 \tag{21}$$

where $P_{CD2,2}$ is defined in (10) and $S_1=8$ from Table 3-3. Note that this is equivalent to the N=9 entry in Table 3-2 given by

$$P_{CD3,2}=49p_D^3(1.-p_D)^6+110p_D^4(1-p_D)^5+126p_D^5(1-p_D)^4+84p_D^6(1-p_D)^3+$$

$$36p_D^7(1-p_D)^2+9p_D^8(1-p_D)+p_D^9 \tag{22}$$

Table 3-6,3-7 and 3-8 list the required single-look probability of detection for $P_{CD,(M),2}$=0.90,0.95 and 0.99 respectively.

TABLE 3-6 REQUIRED SINGLE-LOOK PROBABILITY OF DETECTION $P_{CD(M),2}=0.9$

N	Value of p_D for $P_{CD(M),2}=0.90$		
	M=3	M=4	M=5
9	0.85747	0.97400	
5	0.77747	0.61768	0.97920
5	0.70769	0.79915	0.90742
9	0.65479	0.72697	0.83041
5	0.61099	0.66686	0.76040
9	0.57429	0.61768	0.69909
10	0.54279	0.57675	0.64721
11	0.51833	0.54519	0.60593
12	0.49498	0.51629	0.56828

TABLE 3-7 REQUIRED SINGLE-LOOK PROBABILITY OF DETECTION $P_{CD(M),2}=0.95$

N	Value of p_D for $P_{CD(M),2}=0.95$		
	M=3	M=4	M=5
4	0.90245	0.98727	
5	0.83555	0.92356	0.98970
6	0.77035	0.84687	0.93715
7	0.72032	0.78013	0.87123
8	0.67701	0.72302	0.80713
9	0.63993	0.67435	0.74868
10	0.60588	0.63273	0.69687
11	0.58276	0.60326	0.65778
12	0.55760	0.57347	0.61943

TABLE 3-8 REQUIRED SINGLE-LOOK PROBABILITY OF DETECTION $P_{CD(M),2}=0.99$

N	Value of p_D for $P_{CD(M),2}=0.99$		
	M=3	M=4	M=5
4	0.95815	0.99740	
5	0.91856	0.96745	0.99790
6	0.86654	0.91556	0.97324
7	0.82645	0.86365	0.93006
8	0.78736	0.81495	0.87908
9	0.74963	0.77058	0.82987
10	0.71010	0.72615	0.77789
11	0.69975	0.70936	0.74879
12	0.67014	0.67758	0.71057

The cumulative probability of detection for M out of N with at least 3 consecutive hits can also be calculated from $P_{CD3,3}$ in a similar manner. Table 3-9 gives the analytical results for the cumulative probability of detection using 4 hits out of N with at least 3 hits consecutive where N varies from 5 to 12. Figure 3-7 and Figure 3-8 show $P_{CD4,3}$ and the improvement factor respectively.

TABLE 3-9 4 OUT OF N WITH AT LEAST 3 CONSECUTIVE HITS

N	$P_{CD4,3}$
5	$4p_D^4(1-p_D)+p_D^5$
6	$9p_D^4(1-p_D)^2+6p_D^5(1-p_D)+p_D^6$
8	$16p_D^4(1-p_D)^3+18p_D^5(1-p_D)^2+7p_D^6(1-p_D)+p_D^7$
8	$25p_D^4(1-p_D)^4+40p_D^5(1-p_D)^3+27p_D^6(1-p_D)^2+8p_D^7(1-p_D)+p_D^8$
9	$36p_D^4(1-p_D)^5+75p_D^5(1-p_D)^4+74p_D^6(1-p_D)^3+36p_D^7(1-p_D)^2+9p_D^8(1-p_D)+p_D^9$
10	$48p_D^4(1-p_D)^6+126p_D^5(1-p_D)^5+165p_D^6(1-p_D)^4+116p_D^7(1-p_D)^3+45p_D^8(1-p_D)^2+10p_D^9(1-p_D)+p_D^{10}$
11	$63p_D^4(1-p_D)^7+195p_D^5(1-p_D)^6+323p_D^6(1-p_D)^5+298p_D^7(1-p_D)^4+164p_D^8(1-p_D)^3+55p_D^9(1-p_D)^2+11p_D^{10}(1-p_D)+p_D^{11}$
12	$81p_D^4(1-p_D)^8+282p_D^5(1-p_D)^7+550p_D^6(1-p_D)^6+666p_D^7(1-p_D)^5+481p_D^8(1-p_D)^4+220p_D^9(1-p_D)^3+66p_D^{10}(1-p_D)^2+12p_D^{11}(1-p_D)+p_D^{12}$

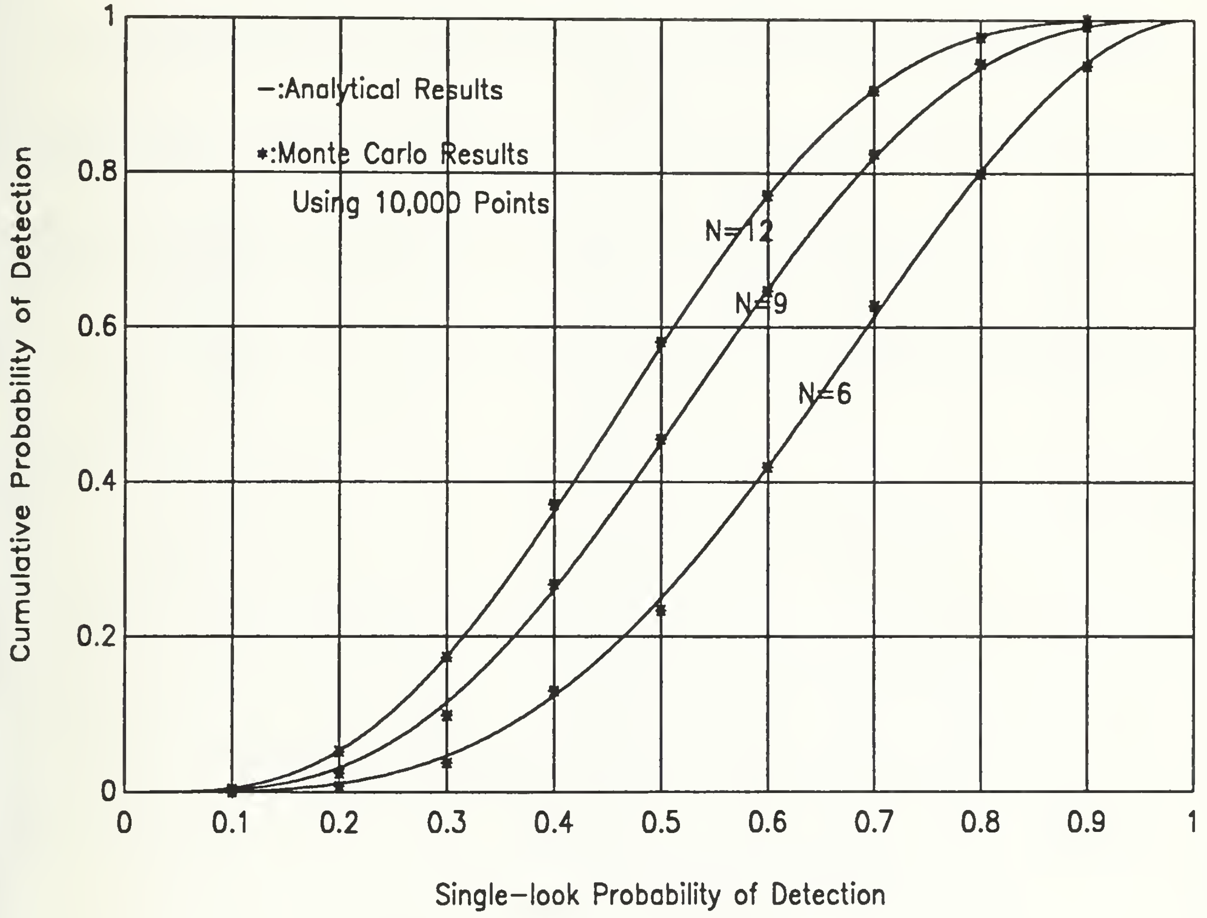

Figure 3-7 Cumulative Probability of Detection for 4 out of N with at Least 3 Consecutive Hits

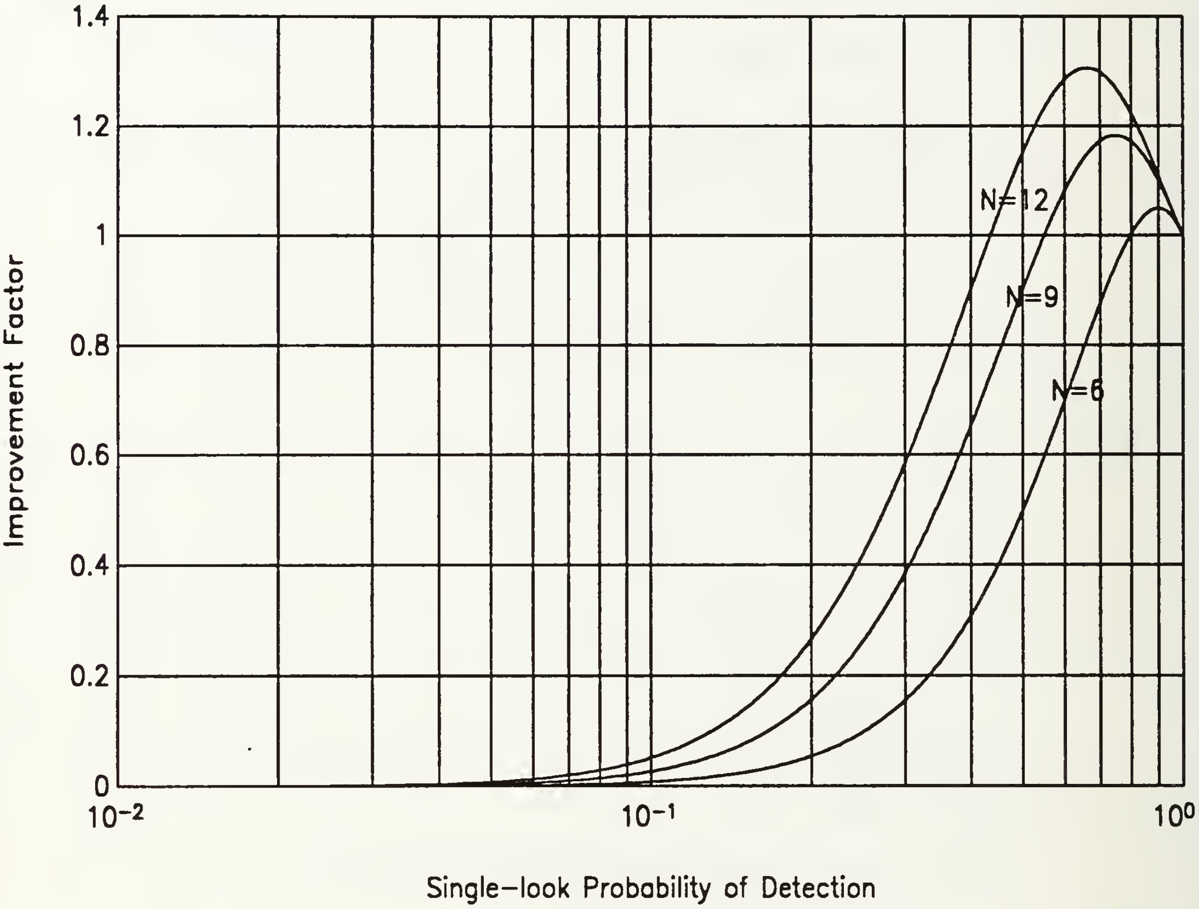

Figure 3-8 Improvement Factor for 4 out of N with at Least 3 Consecutive Hits

Table 3-10 gives the analytical results for the cumulative probability of detection using 5 out of N with at least 3 consecutive hits where N varies from 6 to 12.

TABLE 3-10 5 OUT OF N WITH AT LEAST 3 CONSECUTIVE HITS

N	$P_{CD5,3}$
6	$6p_D^5(1-p_D)+p_D^6$
7	$18p_D^5(1-p_D)^2+7p_D^6(1-p_D)+p_D^7$
8	$40p_D^5(1-p_D)^3+27p_D^6(1-p_D)^2+8p_D^7(1-p_D)+p_D^8$
9	$75p_D^5(1-p_D)^4+74p_D^6(1-p_D)^3+36p_D^7(1-p_D)^2+9p_D^8(1-p_D)+p_D^9$
10	$126p_D^5(1-p_D)^5+165p_D^6(1-p_D)^4+116p_D^7(1-p_D)^3+45p_D^8(1-p_D)^2+10p_D^9(1-p_D)+p_D^{10}$
11	$195p_D^5(1-p_D)^6+323p_D^6(1-p_D)^5+298p_D^7(1-p_D)^4+164p_D^8(1-p_D)^3+55p_D^9(1-p_D)^2+11p_D^{10}(1-p_D)+p_D^{11}$
12	$282p_D^5(1-p_D)^7+550p_D^6(1-p_D)^6+666p_D^7(1-p_D)^5+481p_D^8(1-p_D)^4+220p_D^9(1-p_D)^3+66p_D^{10}(1-p_D)^2+12p_D^{11}(1-p_D)+p_D^{12}$

Figure 3-9 and Figure 3-10 show $P_{CD5,3}$ and the improvement factor.

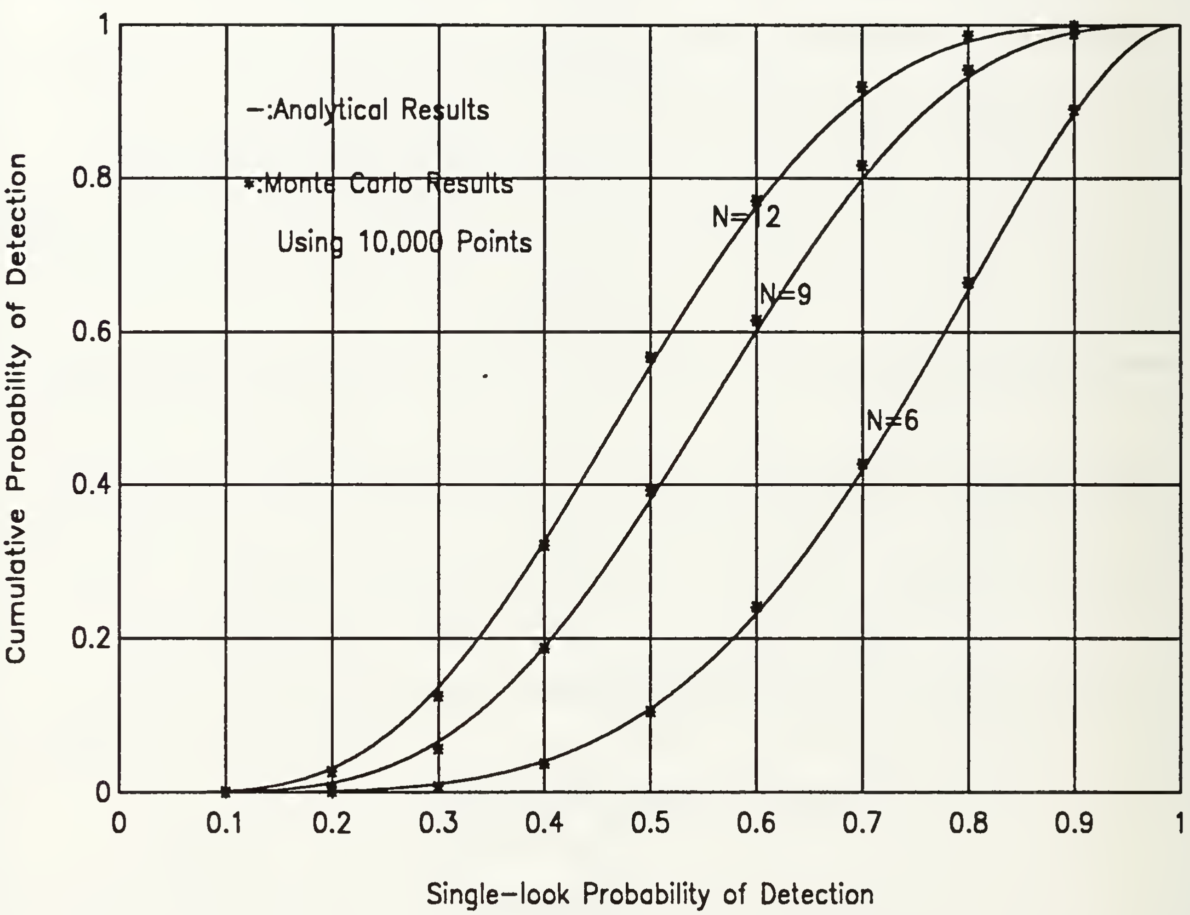

Figure 3-9 Cumulative Probability of Detection for 5 out of N with at Least 3 Consecutive Hits

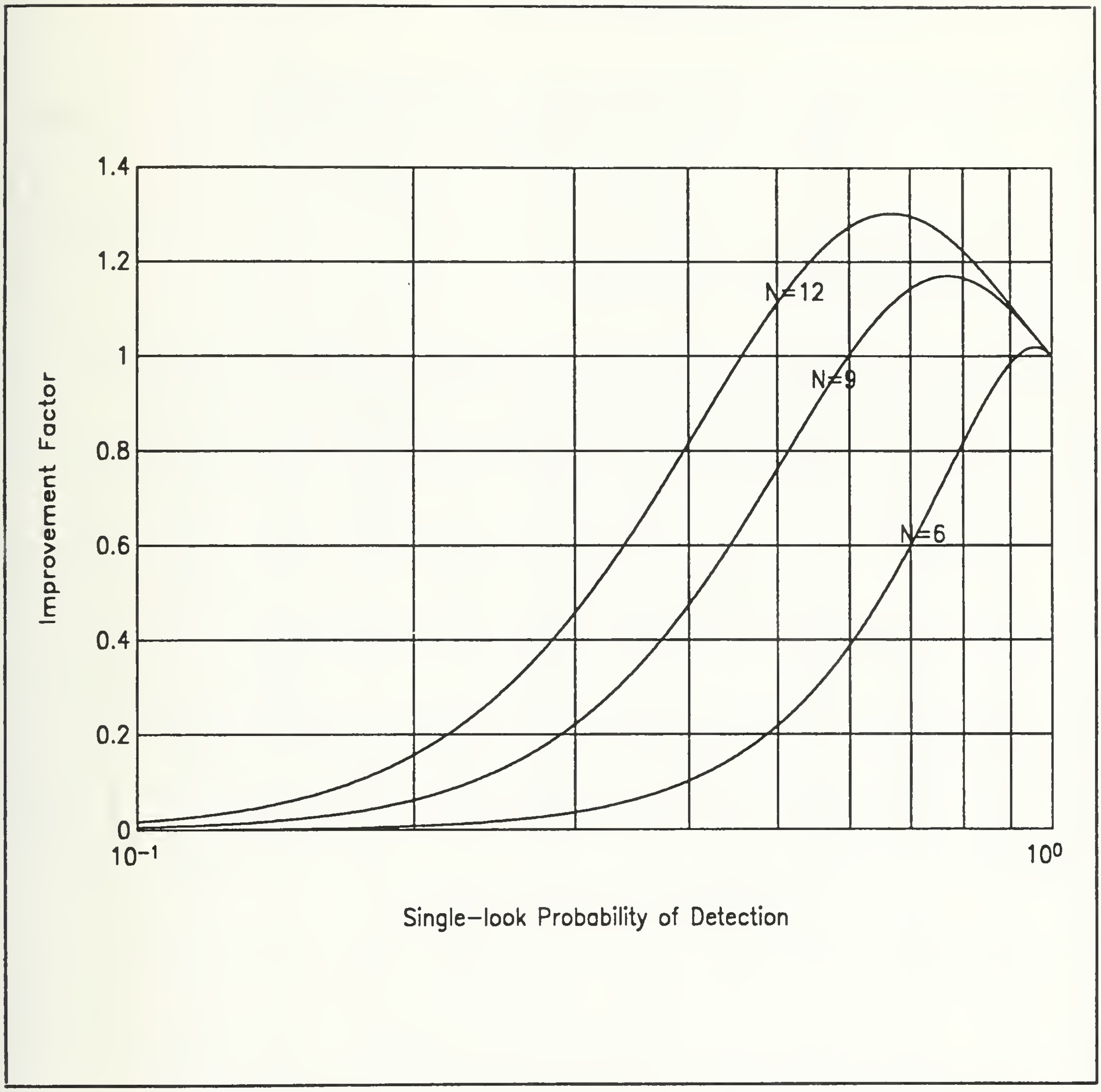

Figure 3-10 Improvement Factor for 5 out of N with at Least 3 Consecutive Hits

The closed form expression for M out of N with at least 3 consecutive hits can be expressed as

$$P_{CD(M),3}=P_{CD(M-1),3}-S_{M-2}p_D{}^{M-1}(1-p_D)^{N-M+1} \tag{23}$$

where S_n is given in Table 3-11.

TABLE 3-11 S_n FOR M OUT OF N WITH AT LEAST 3 CONSECUTIVE HITS

N	S_2	S_2	S_3	S_5	S_5	S_5	S_3	S_5	S_3	S_{10}
5	2	9	1							
6	3	9	6	1						
7	4	18	18	7	1					
8	6	25	10	27	9	1				
8	9	36	75	74	36	9	1			
10	7	48	126	165	116	45	10	1		
11	8	63	195	323	298	164	55	11	1	
12	9	81	282	550	666	481	220	66	12	1

The required single look probability of detection for $P_{CD(M),3}$=0.90,0.95 and 0.99 are also given in Table 3-11,3-12 and 3-13.

TABLE 3-12 REQUIRED SINGLE-LOOK PROBABILITY OF DETECTION $P_{CD(M),3}=0.9$

N	Value of p_D for $P_{CD(M),3}=0.90$		
	M=3	M=4	M=5
4	0.95004	0.97400	
5	0.91790	0.92697	0.97920
6	0.85790	0.86302	0.90780
7	0.82594	0.82793	0.85261
8	0.79192	0.79321	0.80693
9	0.76095	0.76190	0.76921
10	0.73567	0.73534	0.73953
11	0.71300	0.71220	0.71495
12	0.69207	0.69135	0.69276

TABLE 3-13 REQUIRED SINGLE-LOOK PROBABILITY OF DETECTION $P_{CD(M),3}=0.95$

N	Value of p_D for $P_{CD(M),3}=0.95$		
	M=3	M=4	M=5
4	0.97498	0.98727	
5	0.95550	0.95912	0.98970
4	0.90247	0.97498	0.93710
7	0.87654	0.87742	0.89338
4	0.87654	0.84620	0.85437
4	0.81576	0.81596	0.82019
10	0.79102	0.79113	0.79347
11	0.76865	0.76875	0.76987
12	0.74705	0.74712	0.74765

TABLE 3-14 REQUIRED SINGLE-LOOK PROBABILITY OF DETECTION $P_{CD(M),3}=0.99$

N	Value of p_D for $P_{CD(M),3}=0.99$		
	M=3	M=4	M=5
4	0.99504	0.99740	
5	0.99030	0.99048	0.99790
6	0.95859	0.95887	0.97320
7	0.94402	0.94415	0.94905
8	0.92210	0.92258	0.92467
9	0.89650	0.89668	0.89736
10	0.87670	0.87672	0.87706
11	0.85677	0.85687	0.85706
12	0.83639	0.83586	0.83603

B. EXACT VALUE OF CONFIDENCE BOUND ON R_{60}-R_{95} IN A GIVEN NUMBER OF DETECTION

In section II, a minimum number of samples(detections) needed to state that $x_{(k)}$ is a lower$(1-\alpha)$ confidence bound on R_{60}-R_{95} was given(Table 2-7) using (14) and (15). This table is useful for finding the minimum number of samples(detections) to achieve a specific confidence bound on R_{60} through R_{95}. However, these tables are not all applicable for the binary integration schemes examined in this section. From the binary integration algorithm M out of N with at least x consecutive hits, the number of detections considered was M=2,3,4 and 5. Exact values of confidence bounds for these four cases can be found by using (14) and (15) when the range is ordered as

$$X_{(1)} \leq X_{(2)} \leq X_{(3)} \ldots \leq X_{(n)} .$$

Table 3-15,3-16 and 3-17 show the exact value of the confidence bound 1-α for R_{60}-R_{95} for the considered number of detections.

TABLE 3-15 EXACT VALUE OF CONFIDENCE BOUND ON R_{60}-R_{95} FOR $x_{(1)}$

$x_{(1)}$	1-α							
	R_{60}	R_{65}	R_{70}	R_{75}	R_{80}	R_{85}	R_{90}	R_{95}
2	0.64	0.58	0.51	0.44	0.36	0.28	0.19	0.10
3	0.78	0.72	0.66	0.58	0.49	0.38	0.27	0.14
4	0.87	0.82	0.76	0.68	0.59	0.45	0.34	0.18
5	0.92	0.88	0.83	0.76	0.67	0.56	0.41	0.23

TABLE 3-16 EXACT VALUE OF CONFIDENCE BOUND ON R_{60}-R_{95} FOR $x_{(2)}$

$x_{(2)}$	$1-\alpha$							
	R_{90}	R_{65}	R_{80}	R_{75}	R_{80}	R_{85}	R_{90}	R_{95}
2	0.18	0.12	0.04	0.28	0.04	0.12	0.01	0.002
3	0.35	0.28	0.28	0.16	0.10	0.06	0.04	0.007
4	0.52	0.04	0.35	0.06	0.18	0.18	0.05	0.01
5	0.66	0.57	0.47	0.37	0.26	0.16	0.08	0.02

TABLE 3-17 EXACT VALUE OF CONFIDENCE BOUND ON R_{60}-R_{95} FOR $x_{(3)}$

$x_{(3)}$	$1-\alpha$							
	R_{60}	R_{65}	R_{80}	R_{80}	R_{80}	R_{85}	R_{90}	R_{95}
3	0.081	0.043	0.027	0.016	0.008	0.003	0.001	.0001
4	0.018	0.130	0.084	0.051	0.030	0.012	0.004	.0005
5	0.032	0.230	0.160	0.100	0.058	0.027	0.008	0.001

This table can be used as follows. If 5 detections(and their corresponding ranges) are considered(e.g., 5 out of N with at least x consecutive hits) the range and azimuth values pass on to their processing to determine if this is truly a target(look(scan)-to-look(scan) correlation etc.,). If the 5 detection ranges are ordered from shortest to furthest(i.e., $x_{(1)}$ $x_{(2)}$ $x_{(3)}$ $x_{(4)}$ $x_{(5)}$) then $x_{(1)}$ is a lower 0.41 confidence bound on R_{90}(the range for which there is a 90% cumulative probability of detection). These $1-\alpha$ values can be used to optimize the correlation and post-detection processing.

IV. CONTRIBUTION, STRENGTHS AND LIMITATIONS

The usual criterion employed in detection performance analysis is the probability that the target is detected on a single look of the radar. It is sometimes argued that this criterion is too conservative in that it ignores the scanning effect of the radar which provides multiple looks at the target. An alternative criterion employs the condition that an approaching target has been detected at least once by the time it reaches a given range. This criterion is most applicable to a situation where the radar operates as a queuing device which causes a more sensitive sensor to confirm the detection. Most target acquisition systems require a number of detections on multiple looks(e.g., three or four detection on five looks) before initiating track. As the number of required detections increases, the detection range approaches that determined for the single look detection criterion.

There are many ways to make cumulative probability of detection calculations. Binary Integration is one of the popular processing techniques for detection of signals in noise. This thesis concentrates on a new binary integration technique which uses M hits out of N looks with at least x<M consecutive hits. Closed form analytical results are derived for the cumulative probability of detection and Monte Carlo simulations are used to verify the solutions. Also derived are the corresponding R_{60} to R_{95} results for the cumulative detections.

Although M out N with at least x consecutive hits criterion is useful for declaring target track, it has several limitations:

(1) This thesis deals only with N from - to 12. If N is greater than 12 analytical expressions become much more difficult to evaluate.

(2) It is assumed that the single-look probability of detection does not change from look(scan) to look(scan). If the single-look probability of detection is changed from look to look, the application of simple logic is not valid.

(3) M has been limited from 3 to 5 at x=2 or 3 to keep the analytical expressions manageable.

APPENDIX.A EXAMPLE OF THE MONTE CARLO SIMULATION RESULTS USING SAS WITH 1000 POINTS FOR 3 OUT OF 9 WITH AT LEAST 2 CONSECUTIVE HITS

```
DATA ONE;N=9;TOT=2**N;NUM=1000;P=0.5;

/* N=9;*/

DO I=1 TO NUM ;

  Y1=RANBIN(34634,1,P);
  Y2=RANBIN(34567,1,P);
  Y3=RANBIN(34789,1,P);
  Y4=RANBIN(34576,1,P);
  Y5=RANBIN(34569,1,P);
  Y6=RANBIN(45840,1,P);
  Y7=RANBIN(34683,1,P);
  Y8=RANBIN(34505,1,P);
  Y9=RANBIN(34903,1,P);

OUTPUT;

END;

PROC PRINT;VAR Y1-Y9;

DATA ONE; SET ONE;
IF Y1=1 AND Y2=1 AND Y4=1 OR Y1=1 AND Y2=1 AND Y5=1 OR Y1=1 AND
Y2=1 AND Y6=1 OR Y1=1 AND Y2=1 AND Y7=1 OR Y1=1 AND Y2=1 AND Y8=1
OR Y1=1 AND Y2=1 AND Y9=1 OR Y2=1 AND Y3=1 AND Y5=1 OR Y2=1 AND
Y3=1 AND Y6=1 OR Y2=1 AND Y3=1 AND Y7=1 OR Y2=1 AND Y3=1 AND Y8=1
OR Y2=1 AND Y3=1 AND Y9=1 OR Y3=1 AND Y4=1 AND Y6=1 OR Y3=1 AND
Y4=1 AND Y7=1 OR Y3=1 AND Y4=1 AND Y8=1 OR Y3=1 AND Y4=1 AND Y9=1
OR Y4=1 AND Y5=1 AND Y7=1 OR Y4=1 AND Y5=1 AND Y8=1 OR Y4=1 AND
Y5=1 AND Y9=1 OR Y5=1 AND Y6=1 AND Y8=1 OR Y5=1 AND Y6=1 AND Y9=1
OR Y6=1 AND Y7=1 AND Y9=1 OR Y1=1 AND Y3=1 AND Y4=1 OR Y1=1 AND
Y4=1 AND Y5=1 OR Y1=1 AND Y5=1 AND Y6=1 OR Y1=1 AND Y6=1 AND Y7=1
OR Y1=1 AND Y7=1 AND Y8=1 OR Y1=1 AND Y8=1 AND Y9=1 OR Y2=1 AND
Y4=1 AND Y5=1 OR Y2=1 AND Y5=1 AND Y6=1 OR Y2=1 AND Y6=1 AND Y7=1
OR Y2=1 AND Y7=1 AND Y8=1 OR Y2=1 AND Y8=1 AND Y9=1 OR Y3=1 AND
Y5=1 AND Y6=1 OR Y3=1 AND Y6=1 AND Y7=1 OR Y3=1 AND Y7=1 AND Y8=1
OR Y3=1 AND Y8=1 AND Y9=1 OR Y4=1 AND Y6=1 AND Y7=1 OR Y4=1 AND
Y7=1 AND Y8=1 OR Y4=1 AND Y8=1 AND Y9=1 OR Y5=1 AND Y7=1 AND Y8=1
OR Y5=1 AND Y8=1 AND Y9=1 OR Y6=1 AND Y8=1 AND Y9=1;

PROC PRINT; PROC SUMMARY; VAR Y1;

OUTPUT OUT=OUT1 SUM=Y1; PROC PRINT;
```

OBS	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9
1	1	0	1	0	1	1	1	1	1
2	0	0	1	0	1	1	0	1	0
3	0	1	0	1	1	1	0	0	0
4	1	0	0	0	1	1	0	0	0
5	0	0	1	1	0	1	0	0	1
6	0	1	1	1	1	0	1	0	1
7	0	0	1	0	0	1	0	0	1
8	0	0	1	0	1	1	1	0	1
9	1	1	0	1	0	1	1	1	1
10	1	0	1	0	0	1	1	0	0
11	0	1	0	0	0	0	1	0	0
12	0	0	0	1	1	1	0	0	0
13	0	1	1	0	1	0	0	0	0
14	0	1	1	0	1	1	0	0	0
15	0	0	0	1	0	1	1	0	0
16	0	0	1	1	0	1	0	0	1
17	0	0	1	0	1	1	0	1	1
18	0	0	0	0	1	0	1	0	0
19	0	1	0	0	0	0	1	0	0
20	0	1	0	1	0	0	1	0	0
21	1	0	0	1	0	1	1	0	0
22	0	1	0	0	1	0	1	0	1
23	0	0	0	1	1	1	0	1	1
24	1	0	0	1	0	1	0	0	1
25	1	0	0	1	0	0	1	1	1
26	1	1	1	0	0	0	0	0	0
27	1	1	0	0	1	0	1	0	0
28	0	1	0	1	0	1	1	0	1
29	0	1	0	0	1	0	1	0	0
30	0	0	0	0	0	1	1	1	0
31	0	0	1	0	1	0	0	1	1
32	0	0	0	0	0	0	1	1	1
33	1	0	0	1	1	0	0	0	1
34	0	1	1	0	1	0	1	0	0
35	0	1	1	0	1	1	0	0	1
36	1	0	0	0	1	0	0	0	0
37	0	1	0	1	1	1	1	1	0
38	0	1	1	0	1	0	1	1	1
39	1	1	0	0	0	1	0	1	1
40	0	0	1	0	0	1	0	1	0
41	1	0	0	0	0	0	1	1	0
42	0	1	1	0	1	1	0	1	1
43	1	1	1	0	1	1	0	0	0
44	1	1	0	0	0	1	1	1	1
45	0	1	1	1	1	1	0	1	0
46	0	1	0	0	0	1	1	1	1
47	1	1	0	0	1	0	0	0	0
48	1	1	0	1	0	0	0	0	0
49	1	0	1	1	1	0	0	1	0
50	1	0	1	1	0	0	0	0	1

OBS	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9
51	1	1	0	1	1	1	1	1	1
52	1	1	0	1	0	1	1	0	1
53	1	0	1	0	1	1	0	1	1
54	0	0	1	1	0	1	1	1	1
55	0	0	0	0	1	1	0	1	0
56	1	0	0	0	0	0	0	1	0
57	0	1	0	1	0	1	0	0	0
58	0	0	0	1	1	0	1	0	0
59	1	1	1	0	0	0	1	1	0
60	0	1	1	1	0	1	0	0	0
61	0	1	0	0	0	1	1	1	0
62	0	0	0	1	1	0	0	1	1
63	0	1	0	1	1	1	1	1	1
64	1	1	1	1	1	0	1	0	0
65	0	0	1	0	0	1	0	1	0
66	1	1	0	0	0	0	1	1	0
67	0	1	0	0	1	0	0	0	1
68	0	1	1	1	1	1	1	1	0
69	1	0	0	0	0	1	0	1	0
70	1	0	0	1	0	1	1	1	0
71	0	0	1	0	0	1	0	0	1
72	0	1	0	0	0	1	1	1	0
73	1	1	0	1	0	1	0	0	0
74	0	0	0	1	0	0	1	0	1
75	1	0	1	1	0	1	0	1	0
76	1	1	1	1	1	0	1	1	0
77	1	1	1	0	0	1	0	1	1
78	0	0	0	0	0	1	1	1	0
79	1	1	1	0	1	0	1	1	1
80	1	0	0	0	1	0	0	1	1
81	1	1	0	0	0	0	1	1	1
82	0	0	0	1	1	1	1	0	0
83	0	0	1	1	1	0	1	0	0
84	0	0	0	0	0	0	1	1	1
85	0	1	1	0	0	1	0	1	1
86	0	0	0	1	1	1	0	0	1
87	0	1	1	0	0	1	1	0	0
88	1	1	1	1	1	0	0	0	0
89	1	1	1	1	0	1	1	0	0
90	1	1	0	0	0	0	1	0	1
91	0	1	1	0	1	0	0	1	1
92	1	0	1	0	1	1	0	1	0
93	0	1	1	0	0	1	0	1	0
94	1	1	1	0	0	0	0	1	1
95	1	1	1	1	1	1	1	0	0
96	0	0	1	1	1	0	0	0	1
97	0	0	1	1	1	0	0	1	1
98	0	1	0	0	1	0	1	0	0
99	0	1	1	1	1	0	1	0	1
100	1	0	0	0	0	1	0	1	0
101	1	1	1	1	0	1	0	0	1

OBS	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9
102	0	1	1	1	0	0	1	0	0
103	1	1	0	1	1	0	1	1	0
104	1	1	1	1	0	0	0	0	1
105	0	1	1	1	0	0	0	1	0
106	1	0	1	0	0	1	0	0	1
107	1	0	1	1	1	0	0	0	1
108	1	0	1	1	1	0	0	1	0
109	1	1	1	1	0	1	0	1	0
110	1	1	1	0	0	0	0	1	0
111	1	1	1	1	1	1	0	1	1
112	1	1	0	0	0	0	0	1	0
113	0	0	1	0	0	0	1	0	0
114	0	1	1	1	0	1	1	0	0
115	0	0	0	1	1	0	0	0	0
116	1	0	0	1	1	1	1	1	1
117	1	0	0	1	1	0	1	1	0
118	0	1	1	0	1	0	1	1	0
119	1	0	1	1	1	1	0	1	1
120	0	1	1	1	1	0	1	0	1
121	0	0	0	0	1	0	1	0	1
122	0	0	1	1	0	0	0	1	1
123	1	1	1	0	0	1	1	0	1
124	1	1	0	0	0	1	0	1	0
125	1	1	1	1	0	0	0	1	1
126	1	0	0	1	1	0	0	0	0
127	1	0	0	0	1	1	1	0	1
128	1	1	0	0	0	1	0	0	1
129	1	1	0	0	1	1	0	1	0
130	1	1	1	1	0	1	0	1	0
131	0	1	1	0	0	1	0	1	1
132	0	0	1	0	0	0	1	0	0
133	1	1	0	1	0	1	0	0	1
134	0	0	1	0	0	0	1	0	0
135	0	0	1	0	1	0	0	1	1
136	1	1	1	1	1	1	1	1	1
137	1	0	0	0	1	0	0	0	0
138	1	1	1	1	0	0	1	1	0
139	1	1	0	0	1	0	0	1	1
140	0	1	1	1	1	1	0	0	1
141	1	0	0	1	1	1	0	0	1
142	1	1	1	0	0	0	1	1	1
143	0	1	0	1	1	1	0	0	1
144	0	0	1	0	0	0	0	0	0
145	0	1	1	0	1	0	1	1	1
146	0	1	0	1	0	1	1	1	1
147	1	1	0	1	1	1	0	0	0
148	0	0	0	1	1	0	0	1	0
149	1	0	1	1	1	0	0	0	0
150	1	1	0	1	0	0	0	0	1
151	0	1	1	0	0	0	0	1	0
152	0	1	0	1	1	0	1	0	0

```
OBS     Y1     Y2     Y3     Y4     Y5     Y6     Y7     Y8     Y9
153      1      0      0      1      1      0      1      0      1
154      1      1      1      1      1      1      0      1      0
155      1      0      0      1      1      0      1      0      0
156      1      0      1      0      1      0      1      0      1
157      0      1      1      1      0      0      1      0      1
158      1      1      0      1      1      1      0      0      0
159      1      0      1      1      1      1      0      1      1
160      1      1      0      1      0      1      1      0      0
161      1      1      1      0      1      1      1      1      0
162      0      0      0      0      0      1      1      1      1
163      0      1      0      1      1      1      0      1      1
164      0      1      0      1      0      0      1      0      0
165      0      0      1      0      0      0      1      0      1
166      0      0      1      1      0      0      0      0      1
167      0      0      0      0      1      1      0      0      0
168      1      1      0      1      0      1      1      0      0
169      0      0      1      1      0      1      0      1      1
170      1      0      1      0      0      0      0      0      0
171      0      1      0      0      0      0      1      0      0
172      0      0      0      0      0      0      1      1      0
173      0      1      0      0      1      1      1      0      0
174      1      0      0      1      0      1      0      1      0
175      0      1      1      0      0      0      0      0      0
176      1      1      0      0      0      0      0      0      0
177      0      0      1      1      1      1      1      1      1
178      1      0      1      0      0      1      1      0      1
179      0      1      1      0      1      1      0      1      1
180      1      1      1      0      0      0      1      1      0
181      1      0      0      1      0      0      0      0      1
182      0      0      0      1      1      1      1      0      1
183      1      1      1      0      0      1      1      0      1
184      0      1      1      1      1      1      0      0      0
185      1      1      1      0      1      0      1      1      1
186      1      0      1      1      1      1      0      1      0
187      1      1      0      0      1      0      1      0      1
188      0      1      0      1      0      1      1      0      1
189      0      0      1      0      0      1      1      1      1
190      0      1      1      0      0      1      1      0      0
191      0      0      0      0      0      1      0      1      1
192      1      1      1      1      1      1      0      0      0
193      0      1      0      0      0      0      0      1      0
194      0      1      1      0      0      1      0      1      0
195      0      1      0      0      0      0      0      0      1
196      1      0      1      1      1      0      0      0      1
197      1      1      0      0      0      1      1      1      0
198      0      1      0      0      0      0      0      0      1
199      0      0      0      1      0      1      0      1      0
200      1      0      0      1      1      0      0      0      0
201      1      0      1      0      1      0      0      1      0
202      0      0      0      1      1      1      1      1      0
203      1      0      0      0      1      1      1      1      1
```

```
OBS     Y1    Y2    Y3    Y4    Y5    Y6    Y7    Y8    Y9
204      1     1     0     0     0     1     1     0     0
205      1     1     0     1     1     1     0     1     1
206      0     0     1     0     0     1     0     0     0
207      1     0     1     1     1     1     0     0     1
208      0     1     0     0     1     0     1     0     0
209      1     0     1     1     1     0     0     0     0
210      1     0     0     0     1     0     1     1     0
211      0     1     0     0     1     0     0     1     0
212      1     0     1     0     0     0     0     0     0
213      1     1     0     1     0     0     0     1     0
214      0     1     1     1     0     1     0     1     0
215      1     1     0     1     1     1     0     0     1
216      1     0     1     0     0     0     0     0     0
217      1     0     0     1     0     1     1     0     0
218      0     1     0     1     0     0     0     0     0
219      1     0     1     0     0     0     1     0     0
220      0     1     0     1     1     1     1     1     0
221      1     1     1     1     0     1     0     1     0
222      1     0     1     0     1     1     1     0     0
223      1     1     0     0     0     1     0     0     0
224      0     0     1     1     1     0     0     1     1
225      0     0     1     0     1     0     1     1     0
226      0     0     0     1     0     0     0     1     1
227      0     1     1     0     1     1     0     1     0
228      0     0     1     1     0     0     0     0     1
229      1     0     1     1     1     1     0     1     1
230      1     1     1     1     0     1     0     0     0
231      0     1     1     0     0     1     0     1     0
232      0     0     1     1     1     1     0     1     1
233      0     1     1     0     0     1     1     0     0
234      1     1     1     0     1     0     0     0     0
235      1     1     1     1     0     0     0     1     1
236      0     0     0     1     1     0     1     0     1
237      1     1     1     1     1     1     1     1     0
238      1     1     0     0     0     1     1     1     1
239      1     0     1     0     0     1     1     1     0
240      0     1     1     0     0     0     0     0     0
241      0     0     1     1     0     1     0     1     1
242      0     1     0     1     0     1     0     1     0
243      1     0     1     1     1     1     1     0     1
244      1     0     1     1     0     1     0     0     0
245      1     0     0     1     1     0     0     1     1
246      0     1     1     1     0     1     0     1     0
247      0     0     0     1     0     1     0     1     0
248      1     1     1     0     1     0     1     1     0
249      0     0     1     0     1     0     1     1     1
250      1     1     0     1     0     0     0     0     1
251      1     0     1     1     0     0     0     1     0
252      0     0     1     1     0     1     1     1     1
253      0     0     0     1     1     0     1     1     0
254      0     1     1     0     1     0     1     0     1
```

OBS	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9
255	1	0	0	0	0	0	1	0	1
256	0	0	0	1	0	1	1	1	0
257	1	1	1	1	0	1	0	1	0
258	1	1	0	1	0	1	1	1	1
259	0	0	1	0	1	0	1	0	1
260	0	1	0	1	0	0	1	1	0
261	0	0	1	0	1	0	0	0	1
262	1	1	0	0	1	0	1	1	1
263	0	0	0	0	1	0	0	0	0
264	1	1	1	1	0	0	0	1	1
265	0	0	1	1	1	0	1	0	0
266	0	1	1	1	1	1	1	1	1
267	1	0	1	1	0	1	1	1	0
268	1	1	1	1	1	1	0	1	1
269	0	0	1	0	1	1	0	1	0
270	1	0	1	1	1	1	1	0	0
271	1	1	1	1	1	0	0	0	0
272	0	0	1	1	1	0	1	1	0
273	1	1	0	0	1	1	1	0	0
274	0	0	1	1	1	0	1	1	0
275	0	1	1	1	0	1	1	0	0
276	1	0	1	0	0	1	1	1	0
277	0	0	0	0	0	1	1	1	0
278	0	0	0	1	1	1	0	1	0
279	1	1	1	0	1	1	1	1	0
280	0	1	1	1	1	1	1	0	0
281	1	0	1	0	0	1	0	1	0
282	0	1	0	0	0	1	1	1	0
283	0	1	1	0	0	1	0	1	1
284	1	0	0	1	1	1	0	1	0
285	1	0	1	0	1	1	0	0	1
286	0	0	0	1	1	0	0	0	0
287	1	1	1	0	1	0	0	0	1
288	1	0	0	0	0	0	1	1	1
289	0	1	1	1	1	0	1	0	1
290	0	0	0	0	1	1	0	1	1
291	1	1	0	1	1	1	1	0	1
292	1	0	1	1	1	0	1	0	0
293	1	0	1	0	1	0	1	0	1
294	0	0	1	1	1	0	0	0	0
295	1	0	0	0	1	0	0	1	1
296	0	1	0	1	1	1	1	1	0
297	0	0	0	0	0	1	1	1	0
298	0	1	0	0	1	1	0	0	0
299	1	1	1	1	1	0	1	1	1
300	1	0	1	1	1	1	0	0	0
301	0	1	1	0	0	0	0	1	1
302	1	1	1	1	1	0	0	0	0
303	1	1	0	0	0	1	0	0	1
304	0	0	1	1	1	0	0	1	0
305	0	0	0	1	0	1	0	0	1

OBS	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9
306	1	0	0	0	0	0	1	1	0
307	0	1	1	1	1	0	0	0	1
308	1	1	1	0	1	0	1	1	1
309	1	1	1	1	0	1	0	1	1
310	1	1	1	1	1	1	0	0	0
311	1	1	1	1	1	1	1	1	0
312	1	0	1	0	0	0	1	1	0
313	0	0	0	1	0	1	0	1	0
314	0	0	0	0	1	1	0	0	1
315	1	0	1	1	1	0	0	1	1
316	1	0	0	0	0	1	1	0	0
317	0	0	0	1	0	1	1	1	0
318	0	1	0	1	0	0	0	1	1
319	0	1	1	1	1	0	1	0	1
320	1	0	0	1	1	1	1	0	1
321	0	1	1	0	0	1	0	0	0
322	0	0	0	1	0	1	1	0	0
323	0	0	1	1	0	0	0	0	0
324	0	0	0	0	0	0	0	0	1
325	0	1	0	0	1	1	1	0	0
326	0	0	0	0	0	1	1	1	1
327	1	0	1	1	1	0	1	0	1
328	1	0	0	0	1	0	1	1	0
329	1	0	1	0	0	0	1	0	1
330	0	1	0	1	0	0	1	1	1
331	0	0	0	0	0	1	1	1	1
332	0	0	0	0	0	1	1	0	1
333	0	1	1	0	0	0	0	1	1
334	1	1	0	0	0	1	0	0	0
335	0	1	0	1	1	0	0	0	0
336	0	1	1	0	1	1	0	0	0
337	0	0	1	1	1	1	0	0	1
338	0	0	1	0	1	0	1	0	1
339	1	0	1	1	0	1	1	1	1
340	0	0	1	1	0	1	0	1	0
341	1	0	1	1	1	1	0	1	1
342	0	1	0	1	0	0	0	1	0
343	0	1	1	1	0	1	1	1	1
344	1	0	1	0	1	1	0	0	1
345	0	1	1	0	1	1	1	1	1
346	1	1	0	1	1	1	1	1	0
347	0	0	0	1	0	1	0	1	1
348	0	0	1	1	1	0	1	0	0
349	0	0	1	1	1	0	0	0	0
350	0	1	0	0	0	1	0	1	1
351	1	1	1	0	1	1	1	0	1
352	0	1	0	1	1	0	1	0	0
353	0	0	0	1	0	1	0	0	0
354	0	0	0	0	0	1	1	1	0
355	1	0	1	1	0	0	1	0	1
356	0	0	1	0	1	1	1	1	0

```
OBS    Y1    Y2    Y3    Y4    Y5    Y6    Y7    Y8    Y9
357     1     1     1     0     1     1     1     0     0
358     0     0     1     1     0     1     0     0     0
359     0     0     0     1     1     1     0     1     0
360     1     1     1     1     0     0     1     1     0
361     1     1     0     0     0     0     0     1     1
362     0     1     0     0     0     1     0     0     1
363     0     0     1     1     1     0     1     1     1
364     1     1     1     1     1     1     1     1     0
365     0     1     1     1     0     1     0     1     0
366     0     0     1     0     0     0     0     0     0
367     1     1     1     0     1     1     1     0     1
368     0     1     0     1     0     1     1     0     1
369     1     1     1     0     0     0     1     1     1
370     1     0     0     1     0     0     0     1     0
371     0     1     1     1     0     1     0     0     1
372     0     0     0     1     0     0     0     0     0
373     1     1     0     1     1     1     0     1     1
374     0     0     1     0     1     1     1     1     0
375     1     1     0     1     0     1     1     1     1
376     0     1     1     1     1     0     1     1     1
377     0     0     0     1     1     0     0     0     1
378     0     0     0     0     1     0     0     0     0
379     1     1     1     0     1     1     0     0     0
380     1     0     1     0     1     0     0     1     1
381     1     0     0     0     0     0     1     0     0
382     1     1     1     1     1     0     1     0     0
383     0     1     0     1     1     0     1     1     1
384     0     0     0     1     1     0     0     1     0
385     0     1     1     1     1     0     1     1     1
386     1     1     0     1     1     1     1     0     0
387     0     0     1     0     1     0     1     1     1
388     0     1     1     1     0     1     0     0     0
389     1     0     0     0     1     1     1     1     0
390     1     1     1     0     1     0     0     1     0
391     0     0     0     0     0     0     1     0     1
392     0     1     0     0     0     0     0     1     0
393     0     0     0     0     1     1     1     0     1
394     0     0     0     1     0     0     0     1     1
395     0     1     1     1     1     1     1     0     0
396     0     1     1     0     1     0     1     0     0
397     1     1     0     1     1     1     1     1     0
398     0     1     1     1     1     0     0     0     1
399     0     1     0     0     1     1     1     1     1
400     1     0     0     1     0     1     0     0     0
401     1     1     1     0     1     1     1     1     1
402     1     1     1     1     1     1     1     0     1
403     1     1     0     1     0     1     0     0     1
404     0     0     0     0     1     0     0     1     1
405     0     1     1     0     0     1     0     0     1
406     0     0     1     1     0     0     0     1     1
407     0     0     1     0     0     1     0     0     0
```

```
OBS     Y1    Y2    Y3    Y4    Y5    Y6    Y7    Y8    Y9
408      1     0     1     1     1     1     1     1     0
409      0     1     0     0     1     1     1     1     1
410      1     1     0     0     0     0     1     1     1
411      1     1     1     0     1     1     1     0     0
412      0     1     1     1     0     1     0     1     0
413      1     0     0     0     0     1     0     0     1
414      1     0     1     1     0     0     0     0     0
415      0     1     0     1     0     0     1     1     0
416      0     0     0     0     1     1     1     0     1
417      1     0     0     1     0     1     1     1     0
418      0     0     0     0     0     0     1     0     1
419      1     0     1     0     1     0     0     0     1
420      1     1     0     1     0     0     1     1     1
421      1     1     0     1     1     1     1     1     0
422      1     0     1     1     0     0     0     1     1
423      0     0     1     1     0     1     1     1     1
424      1     1     1     1     1     0     0     0     0
425      0     0     1     0     1     1     1     0     1
426      0     1     0     0     1     1     1     0     1
427      1     0     0     0     1     0     1     1     1
428      1     0     0     0     0     1     0     1     1
429      1     1     0     0     0     1     1     1     1
430      0     0     1     0     0     1     1     1     0
431      0     1     1     0     1     0     1     0     1
432      1     0     1     1     0     0     0     0     1
433      0     1     1     1     0     0     1     1     0
434      0     0     0     1     0     0     1     1     0
435      1     1     0     0     0     0     0     1     0
436      1     1     0     1     0     0     0     1     1
437      1     1     1     1     1     0     1     0     1
438      1     0     1     1     0     1     0     1     0
439      1     0     0     1     0     0     0     0     1
440      0     1     1     0     1     1     1     0     0
441      0     1     1     1     0     0     1     1     0
442      1     0     1     0     0     1     0     0     0
443      0     1     1     1     0     0     0     1     1
444      1     1     0     1     1     1     1     0     0
445      0     1     0     1     1     1     1     0     0
446      1     1     1     0     0     0     1     0     0
447      1     0     1     0     1     0     0     0     0
448      1     1     1     0     0     1     0     0     1
449      1     1     1     1     1     0     1     1     1
450      1     1     1     1     0     0     1     1     0
451      0     0     1     1     0     0     1     1     0
452      0     0     0     1     1     0     0     0     1
453      0     1     1     1     1     1     0     1     0
454      0     1     1     0     1     0     1     0     1
455      0     1     0     1     0     1     0     1     0
456      0     0     0     0     1     0     1     1     0
457      1     1     0     1     1     1     0     0     0
458      0     1     0     0     0     1     1     1     1
```

OBS	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9
459	0	0	1	0	0	1	1	0	0
460	0	0	1	0	1	1	0	1	0
461	1	1	0	1	1	1	0	0	1
462	1	0	0	0	1	1	0	0	0
463	0	1	0	0	1	1	1	0	1
464	1	1	1	0	0	0	0	1	0
465	1	0	1	1	1	1	0	0	0
466	1	0	1	0	1	0	1	1	0
467	1	1	0	0	1	0	0	1	1
468	0	0	1	0	1	0	0	1	1
469	1	1	1	0	0	1	0	0	0
470	1	1	0	1	0	1	0	0	0
471	0	1	1	0	1	1	1	0	0
472	1	0	1	0	0	1	1	0	1
473	0	0	1	0	1	0	1	1	1
474	0	1	0	0	0	0	1	0	1
475	0	0	1	0	0	0	1	0	1
476	0	1	0	1	1	0	1	1	0
477	0	1	0	0	1	1	1	0	1
478	1	0	1	1	0	1	1	1	1
479	1	1	0	1	1	0	1	0	0
480	1	1	1	1	0	1	0	0	1
481	0	0	1	1	1	0	0	1	1
482	0	1	1	0	0	1	0	1	1
483	1	1	0	1	1	1	1	1	1
484	0	1	1	0	0	0	0	0	1
485	1	0	1	1	1	1	0	1	0
486	1	0	0	1	0	1	0	1	0
487	0	1	1	1	1	0	1	0	1
488	0	1	0	1	0	0	0	1	1
489	1	0	0	1	0	0	1	0	0
490	0	0	1	0	0	1	0	1	0
491	1	1	0	0	0	1	1	1	1
492	0	0	1	1	0	1	0	0	1
493	1	1	0	0	0	0	0	1	1
494	0	1	0	0	0	1	1	0	0
495	1	0	1	0	1	0	1	1	1
496	1	0	0	1	0	1	1	0	0
497	1	1	1	0	0	1	0	0	1
498	1	0	1	1	1	1	1	1	0
499	1	1	0	1	0	0	0	1	1
500	0	0	1	0	1	0	0	1	1
501	1	0	1	1	1	1	0	0	1
502	0	0	1	1	1	1	1	1	1
503	1	0	0	1	0	0	1	1	1
504	0	0	1	0	1	1	0	0	0
505	1	1	1	1	0	1	0	1	0
506	1	1	0	1	1	0	1	1	0
507	1	1	0	1	0	1	0	0	1
508	0	0	1	1	0	1	0	0	1
509	0	0	0	1	0	1	1	0	0

OBS	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9
510	1	1	1	1	1	0	0	1	0
511	0	0	1	1	1	1	0	1	0
512	0	0	0	1	0	0	1	1	0
513	1	1	1	1	1	1	0	1	0
514	0	1	1	1	1	1	0	0	0
515	0	0	1	0	0	0	0	1	1
516	1	1	1	0	1	1	0	0	1
517	1	0	1	0	1	0	0	0	0
518	1	0	0	1	0	1	1	0	0
519	1	1	0	0	0	0	0	0	1
520	1	0	0	1	0	0	1	1	1
521	0	1	1	0	1	1	0	0	1
522	1	0	0	0	0	1	1	0	0
523	0	1	1	1	0	1	0	0	0
524	0	1	0	0	1	1	0	0	0
525	0	0	1	0	0	0	0	0	1
526	1	0	1	1	0	1	0	1	1
527	0	1	0	1	0	1	1	0	1
528	0	0	1	1	0	0	1	1	0
529	0	0	1	1	1	0	1	0	0
530	1	0	0	1	1	1	0	0	0
531	0	0	0	1	1	0	0	1	0
532	0	0	0	0	0	0	1	1	0
533	0	0	1	1	1	1	1	1	1
534	0	0	1	0	1	0	0	1	1
535	1	0	1	0	0	0	1	0	1
536	1	1	0	1	0	0	0	1	1
537	0	1	0	0	0	1	1	0	1
538	0	0	0	1	0	0	0	1	1
539	1	0	1	0	1	1	1	0	1
540	0	1	1	1	0	0	0	0	0
541	1	1	0	0	1	1	0	0	1
542	0	0	1	0	1	0	1	1	0
543	0	1	0	0	0	1	1	0	1
544	1	1	1	0	1	0	1	0	0
545	1	1	0	0	1	1	1	1	1
546	1	0	1	1	0	0	1	0	0
547	0	1	1	0	0	1	1	0	1
548	1	0	1	1	0	0	1	1	0
549	0	0	1	0	0	1	1	0	0
550	0	1	1	0	1	1	1	0	0
551	1	0	0	0	1	0	1	0	1
552	1	1	0	0	0	1	1	0	1
553	0	1	0	1	0	0	0	0	1
554	0	0	1	1	1	0	1	1	1
555	1	1	0	0	1	0	0	0	0
556	0	0	1	1	0	0	1	1	1
557	1	0	1	0	1	1	1	0	0
558	1	1	1	0	0	0	0	1	0
559	1	1	1	1	0	0	1	1	1
560	1	1	0	0	1	0	0	1	1

OBS	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9
561	0	0	1	1	1	0	1	1	0
562	0	0	0	0	0	1	0	1	0
563	1	1	0	1	0	0	1	1	1
564	0	0	0	0	0	0	1	0	1
565	0	1	0	1	0	1	1	1	1
566	0	1	1	0	0	1	1	0	1
567	0	1	0	1	1	0	0	1	0
568	0	1	0	0	0	1	1	1	0
569	1	0	1	0	0	0	1	1	1
570	0	1	1	0	1	1	0	0	1
571	0	1	1	0	1	0	0	1	0
572	1	0	1	0	1	0	1	0	1
573	0	0	0	0	1	1	1	0	0
574	1	0	1	0	0	1	1	1	0
575	1	1	1	0	0	0	0	1	1
576	1	1	1	0	0	1	1	0	1
577	1	1	0	0	0	0	1	0	0
578	1	1	0	0	1	0	1	1	0
579	0	1	1	1	0	0	1	0	0
580	1	0	0	0	0	1	1	1	0
581	0	0	0	0	1	0	1	0	0
582	1	0	1	0	0	1	1	1	0
583	1	0	0	1	1	1	1	1	1
584	0	1	1	1	1	1	1	0	0
585	0	0	1	0	1	1	0	1	1
586	1	1	0	0	0	1	1	1	0
587	0	0	0	0	1	1	1	0	1
588	0	1	0	0	1	1	1	0	0
589	1	1	1	0	1	0	1	1	1
590	0	0	0	1	1	1	0	0	0
591	0	0	0	1	0	0	0	1	1
592	0	1	1	1	1	0	1	1	0
593	1	0	0	1	1	0	1	0	0
594	0	1	0	1	1	1	0	0	1
595	1	0	1	0	1	1	0	0	1
596	0	0	1	1	0	1	1	0	0
597	1	1	0	1	0	1	0	0	0
598	1	1	0	0	1	1	1	1	1
599	0	1	0	1	0	0	1	0	0
600	1	1	0	1	0	0	1	0	1
601	1	1	0	1	1	1	1	0	0
602	1	0	0	0	0	1	1	0	0
603	1	0	1	0	0	0	0	0	1
604	1	0	1	0	0	1	0	0	1
605	0	1	1	1	1	1	1	1	0
606	1	1	1	1	0	0	1	0	1
607	1	1	0	0	1	1	0	0	0
608	1	1	1	0	0	1	0	1	1
609	1	0	1	0	1	1	1	1	1
610	1	1	0	0	0	1	1	0	0
611	1	0	1	0	0	1	0	1	0

OBS	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9
612	0	0	1	1	0	0	0	1	1
613	0	0	1	1	1	0	0	1	1
614	0	1	0	1	1	0	1	0	1
615	1	1	0	0	0	0	1	0	1
616	0	0	0	1	0	0	1	1	1
617	1	1	0	0	0	0	1	0	1
618	1	1	0	0	0	1	1	1	0
619	1	0	0	0	1	0	1	0	0
620	1	0	1	0	0	0	0	1	0
621	0	1	0	0	0	0	0	1	0
622	0	0	1	1	1	0	1	1	0
623	0	1	0	0	0	1	0	0	1
624	1	1	1	1	1	0	1	0	0
625	1	0	1	0	1	1	0	0	0
626	1	1	0	1	1	1	1	1	0
627	1	0	0	0	0	1	1	1	1
628	0	1	1	1	1	0	1	1	1
629	1	0	0	1	0	1	0	1	1
630	1	0	1	0	0	0	0	0	0
631	0	0	0	1	1	0	0	1	0
632	0	1	1	0	0	1	0	1	1
633	0	0	0	0	1	1	1	1	0
634	0	1	0	0	1	1	1	1	0
635	1	0	0	0	0	1	1	1	1
636	1	1	0	0	1	1	0	0	0
637	0	1	0	1	1	1	1	0	0
638	0	1	1	1	1	1	1	0	1
639	0	0	0	0	0	1	1	0	1
640	1	1	0	1	1	0	1	1	1
641	0	0	0	0	1	0	0	0	1
642	1	1	0	1	0	0	0	0	1
643	0	0	0	0	0	0	1	0	1
644	0	1	1	0	0	0	1	1	1
645	1	1	1	1	1	0	0	1	0
646	1	1	0	0	0	0	0	1	0
647	1	1	1	0	1	1	0	1	0
648	0	1	1	1	1	1	0	0	1
649	1	1	1	1	0	1	0	0	0
650	0	0	1	0	1	0	0	0	1
651	0	0	0	1	1	1	1	0	1
652	1	0	0	1	1	1	1	0	1
653	1	0	0	1	1	0	1	1	0
654	1	1	1	0	0	1	1	1	0
655	0	1	0	1	0	0	0	0	0
656	1	0	1	0	0	0	0	0	1
657	0	0	0	1	0	1	1	1	1
658	0	0	1	1	1	1	0	1	1
659	0	1	1	0	0	1	0	1	1
660	1	1	0	1	0	1	0	0	1
661	1	1	0	1	1	1	0	1	0
662	0	0	0	1	1	1	1	1	1

OBS	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9
663	0	0	0	0	0	1	0	1	0
664	0	1	1	0	1	0	1	0	1
665	1	1	1	1	0	0	1	0	1
666	1	1	1	0	1	0	0	0	0
667	1	0	0	1	1	0	1	0	0
668	0	1	0	0	1	0	0	1	1
669	1	0	0	1	1	0	1	1	1
670	1	1	1	0	1	0	1	1	1
671	1	1	1	1	0	1	0	1	1
672	1	0	1	1	1	0	0	1	0
673	1	1	0	1	0	0	0	1	1
674	0	0	0	1	0	1	0	0	0
675	0	1	0	1	1	0	1	1	1
676	1	0	0	1	0	1	1	0	0
677	1	0	0	1	0	0	0	0	0
678	0	0	1	1	1	0	1	1	1
679	0	0	0	0	0	1	0	0	0
680	1	1	0	0	1	1	0	1	0
681	1	0	1	1	1	0	1	0	0
682	1	0	0	0	0	0	0	1	1
683	0	1	0	1	1	1	0	1	0
684	1	0	1	1	1	0	0	1	0
685	1	0	0	0	1	0	0	1	0
686	1	0	0	0	1	1	1	0	0
687	0	0	0	1	1	1	1	1	0
688	1	0	1	0	1	0	0	1	1
689	1	1	0	1	1	0	1	0	0
690	0	1	0	0	1	1	0	0	1
691	1	0	0	0	1	1	0	0	0
692	0	1	0	0	0	1	0	0	0
693	1	0	1	1	0	0	1	1	0
694	0	1	1	0	1	0	0	0	0
695	0	1	0	0	1	0	0	1	0
696	0	1	0	0	0	0	0	0	1
697	0	1	0	0	1	1	0	0	0
698	1	0	1	0	0	0	1	1	0
699	1	0	1	1	1	1	1	1	0
700	1	0	0	0	1	0	1	1	1
701	0	0	1	1	1	1	0	1	1
702	0	1	1	0	1	0	0	1	0
703	0	1	1	0	1	0	1	0	1
704	0	1	0	1	1	0	1	1	0
705	1	0	0	1	1	1	0	0	0
706	0	1	0	0	0	1	1	1	1
707	1	1	0	0	1	1	0	0	1
708	0	0	0	0	1	1	1	0	0
709	0	1	1	0	0	0	0	0	1
710	1	1	1	0	1	1	1	0	1
711	0	0	1	1	1	0	1	1	0
712	0	0	1	1	1	0	0	0	0
713	1	1	0	0	1	1	1	1	1

OBS	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9
714	1	0	1	1	0	0	0	0	0
715	0	1	0	0	0	0	1	0	1
716	1	1	1	1	1	0	0	1	1
717	0	1	0	1	0	1	0	1	1
718	0	1	0	1	1	0	0	0	1
719	1	0	1	1	1	0	0	0	1
720	0	0	1	0	0	1	0	1	0
721	0	1	1	0	1	0	0	1	0
722	1	1	1	1	1	1	0	0	0
723	1	1	0	0	0	1	1	1	1
724	0	1	1	1	1	1	0	1	1
725	1	0	1	0	1	1	1	0	1
726	1	1	0	0	0	0	0	0	1
727	1	1	1	0	0	1	0	0	1
728	1	1	1	1	0	0	1	1	1
729	0	1	0	0	0	1	1	1	1
730	1	0	0	1	1	0	1	1	1
731	0	1	1	1	1	0	0	1	0
732	1	0	1	1	1	0	0	1	0
733	0	0	1	1	1	0	1	0	1
734	1	0	0	1	0	0	1	1	1
735	0	1	1	1	1	0	0	0	1
736	0	1	0	0	0	1	0	1	1
737	0	1	1	0	0	0	1	1	1
738	0	0	0	1	1	1	0	1	1
739	1	0	1	1	0	0	0	0	0
740	0	1	1	1	1	1	0	1	0
741	1	0	0	1	1	1	0	1	1
742	1	1	0	0	0	1	0	1	1
743	1	1	1	1	1	0	1	0	0
744	0	0	1	0	0	0	0	1	0
745	0	0	1	1	0	1	1	1	1
746	0	0	0	0	0	0	1	1	0
747	0	1	1	0	1	1	0	0	1
748	0	1	1	0	0	0	1	0	0
749	1	0	1	0	1	0	0	0	0
750	0	0	1	0	0	0	1	1	1
751	0	1	1	0	1	0	0	0	1
752	1	0	1	0	0	0	0	0	0
753	0	1	0	0	0	0	1	0	1
754	1	0	1	0	1	1	1	0	0
755	1	0	1	0	0	1	1	1	1
756	0	1	1	1	1	1	0	1	0
757	1	0	1	1	0	0	0	0	0
758	1	1	1	0	1	1	0	0	1
759	0	1	1	0	1	0	1	1	0
760	1	0	1	0	1	1	1	0	1
761	1	0	1	1	0	0	0	1	1
762	0	1	0	0	1	1	0	0	0
763	1	1	1	0	0	1	0	0	1
764	1	0	1	1	1	1	0	0	0

```
OBS     Y1    Y2    Y3    Y4    Y5    Y6    Y7    Y8    Y9
765      0     0     0     0     0     1     1     0     1
766      1     0     0     0     1     0     1     1     0
767      0     1     1     1     0     1     0     0     1
768      1     0     1     1     1     0     1     1     0
769      0     1     1     0     1     0     0     1     0
770      0     1     0     0     0     1     1     0     1
771      0     1     1     0     0     0     0     1     1
772      1     0     1     0     0     1     1     1     0
773      1     0     0     0     0     1     0     0     0
774      1     1     0     0     0     1     0     1     0
775      1     0     0     1     0     1     1     1     1
776      1     1     0     1     0     1     0     0     0
777      1     1     0     1     1     1     1     0     1
778      1     0     0     0     1     1     1     0     1
779      0     1     1     0     1     0     0     1     1
780      1     0     0     0     1     1     0     1     0
781      1     0     1     1     0     1     0     1     1
782      1     1     1     1     0     1     0     1     0
783      0     1     1     1     0     0     1     1     1
784      1     0     0     1     0     0     0     0     1
785      1     1     1     1     1     1     0     0     0
786      1     0     0     0     0     0     1     1     0
787      0     0     0     1     1     1     1     0     1
788      1     1     1     1     0     1     1     0     0
789      1     0     1     1     1     0     1     1     1
790      1     1     1     0     1     1     1     1     1
791      0     0     1     0     1     0     1     0     1
792      0     0     0     1     1     1     1     0     1
793      1     1     1     1     1     1     0     1     1
794      1     1     1     0     1     0     1     1     1
795      1     1     1     0     0     1     1     0     1
796      1     1     1     0     0     0     1     0     1
797      0     0     0     0     1     0     0     0     1
798      0     1     0     1     1     1     0     1     0
799      1     1     1     0     1     0     1     0     0
800      0     1     0     1     1     1     0     1     0
801      1     1     1     1     0     1     0     1     1
802      1     0     0     0     1     1     1     0     1
803      1     0     1     1     1     1     1     1     0
804      0     0     1     0     0     1     1     1     1
805      1     1     1     1     1     0     1     0     1
806      0     0     0     1     1     1     0     0     1
807      0     0     1     0     0     0     1     0     1
808      0     1     0     0     0     0     0     1     0
809      0     1     0     0     0     1     1     0     1
810      1     0     0     1     1     0     0     0     0
811      1     1     0     0     1     0     0     1     1
812      1     1     1     0     1     0     0     1     0
813      0     0     0     0     1     0     1     1     0
814      1     0     1     1     0     1     0     0     0
815      1     1     0     0     1     1     1     1     0
```

OBS	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9
816	1	1	1	1	0	1	1	1	0
817	0	1	1	0	0	0	1	0	0
818	1	1	1	1	0	0	0	0	0
819	1	1	0	1	1	1	1	1	1
820	1	0	0	1	1	1	1	0	0
821	0	0	1	1	1	0	0	1	0
822	1	0	1	1	1	0	0	0	1
823	0	0	1	0	0	1	1	1	0
824	1	1	1	0	1	0	0	0	0
825	0	0	0	0	0	0	0	0	0
826	0	0	1	0	1	0	1	0	1
827	0	0	1	0	1	0	0	0	1
828	1	1	0	1	1	1	0	1	1
829	0	0	1	1	1	0	0	1	1
830	1	0	1	0	1	0	1	1	1
831	1	0	0	1	0	0	1	1	1
832	0	0	0	0	0	0	1	1	0
833	0	0	1	0	0	0	0	1	0
834	0	0	1	0	0	1	0	1	0
835	1	1	0	0	0	0	1	1	0
836	1	1	1	0	0	1	1	1	0
837	0	1	0	0	1	0	0	1	1
838	1	1	0	1	0	1	1	1	1
839	1	0	0	0	0	0	1	0	0
840	0	0	1	0	1	1	1	0	0
841	0	1	1	0	0	1	0	0	1
842	0	0	0	1	0	0	0	1	0
843	1	0	1	0	0	0	0	0	0
844	0	0	0	1	1	1	0	1	1
845	1	0	0	1	1	1	1	0	0
846	0	1	1	0	0	1	1	1	1
847	1	0	1	1	1	0	0	1	1
848	1	1	0	1	1	1	0	0	0
849	0	0	1	1	1	1	0	1	1
850	0	0	0	0	0	0	0	1	1
851	1	0	0	1	1	1	0	0	0
852	1	1	0	1	1	1	1	0	0
853	0	1	1	0	1	1	1	1	0
854	1	1	0	1	0	1	1	1	1
855	1	1	0	1	1	0	1	0	0
856	1	1	1	0	1	1	0	0	0
857	0	0	1	0	0	1	0	0	0
858	1	0	1	1	1	1	0	0	1
859	0	0	1	0	0	0	1	1	0
860	1	0	0	1	1	1	0	1	1
861	0	1	1	1	1	1	1	1	1
862	0	0	0	0	0	0	0	0	0
863	0	0	0	0	1	1	0	1	0
864	1	1	1	0	0	1	1	0	1
865	0	0	0	0	0	1	1	0	1
866	1	1	0	1	0	0	1	0	1

OBS	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9
867	0	1	0	0	1	0	1	0	1
868	1	1	1	1	1	1	0	0	0
869	1	1	1	1	0	0	0	0	1
870	1	1	1	1	0	0	1	1	0
871	0	0	0	0	1	1	1	0	0
872	1	1	0	0	0	0	1	0	0
873	1	0	0	1	0	1	1	0	0
874	1	1	0	0	1	1	1	1	1
875	0	0	1	1	1	0	1	1	0
876	1	0	1	0	0	1	0	1	0
877	1	1	1	1	0	0	1	0	0
878	1	1	0	0	0	0	0	0	0
879	0	1	1	0	1	0	0	1	1
880	0	1	1	0	0	0	1	0	1
881	1	0	1	0	0	0	0	0	1
882	0	0	0	1	0	0	1	1	1
883	1	1	0	1	0	1	0	0	1
884	1	0	0	0	1	1	1	0	0
885	1	0	0	1	1	0	1	0	1
886	0	1	0	1	1	0	1	1	0
887	1	0	0	0	1	0	1	0	0
888	1	0	0	1	0	0	0	0	0
889	0	0	0	1	0	0	0	0	1
890	0	1	0	1	1	0	0	0	1
891	0	0	1	0	1	0	0	0	0
892	0	1	1	1	1	1	0	0	1
893	0	0	0	0	1	1	1	0	0
894	1	0	1	0	1	0	1	1	0
895	0	1	1	0	0	1	0	0	0
896	1	1	0	0	0	1	1	0	1
897	1	0	0	1	1	1	0	0	0
898	1	1	1	1	1	1	0	0	1
899	0	0	0	0	0	1	0	1	0
900	0	1	1	0	0	0	0	1	0
901	1	0	0	1	1	1	0	0	0
902	0	1	0	0	1	1	1	1	1
903	1	1	0	1	1	0	0	0	0
904	0	0	1	1	1	0	1	1	0
905	0	0	0	1	1	0	0	1	1
906	1	0	1	0	0	1	0	1	0
907	0	1	0	1	1	1	0	0	1
908	1	0	0	0	1	1	1	1	0
909	1	1	1	1	0	0	0	0	0
910	1	1	1	1	1	0	0	0	0
911	0	0	1	0	1	0	1	1	0
912	0	1	0	1	1	0	0	1	1
913	1	1	0	0	0	1	0	0	1
914	0	0	1	0	0	1	1	1	0
915	0	1	0	0	1	0	0	1	0
916	0	1	0	0	0	0	1	0	0
917	0	1	1	1	0	1	0	0	1

OBS	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9
918	0	0	1	0	1	0	0	0	0
919	1	0	1	0	0	1	0	1	0
920	1	0	0	0	0	0	0	0	1
921	0	0	1	1	0	0	0	1	0
922	1	0	0	0	0	1	1	1	0
923	1	1	0	1	1	0	0	1	0
924	1	1	1	1	0	1	0	0	0
925	0	0	1	1	0	0	1	0	0
926	1	0	0	0	1	1	0	0	0
927	1	0	1	1	1	0	0	1	1
928	0	1	0	0	1	0	1	0	0
929	0	0	1	1	0	1	1	1	0
930	1	1	1	0	0	0	1	0	0
931	0	0	1	0	1	1	1	0	0
932	1	0	0	1	0	0	1	0	1
933	1	1	0	0	0	0	0	0	0
934	1	1	0	1	0	0	0	1	1
935	0	1	0	0	1	1	0	0	0
936	0	0	0	0	1	1	1	1	1
937	0	1	0	1	0	0	0	1	0
938	1	0	0	1	1	1	1	1	1
939	0	1	0	0	1	0	1	1	1
940	0	0	0	0	0	1	1	1	1
941	1	0	1	1	0	0	1	0	1
942	0	1	0	0	0	0	0	0	1
943	0	1	1	0	0	1	1	1	1
944	0	1	1	0	1	0	0	1	0
945	0	1	0	0	1	0	1	0	1
946	0	1	0	1	1	0	0	1	0
947	0	0	1	1	1	0	1	1	0
948	1	0	0	0	1	0	0	1	1
949	0	1	1	0	0	1	1	0	0
950	1	0	1	1	1	1	1	1	1
951	1	1	0	0	0	0	1	0	0
952	1	0	1	0	0	1	1	1	1
953	1	0	1	0	0	0	1	0	0
954	1	0	1	1	0	1	0	0	0
955	0	0	0	1	0	0	1	0	1
956	1	0	0	1	0	1	0	1	1
957	0	0	0	0	1	1	1	1	1
958	0	0	0	1	1	1	0	0	1
959	0	1	1	0	1	1	0	1	0
960	0	1	1	0	0	1	1	0	1
961	0	1	1	1	1	0	1	1	1
962	0	1	0	0	0	0	0	0	1
963	1	0	0	1	0	1	1	1	1
964	0	0	1	0	1	0	1	0	1
965	1	1	0	1	0	0	1	1	0
966	0	0	0	0	1	0	1	1	1
967	1	1	0	0	1	1	1	1	1
968	0	0	0	0	0	1	0	1	1

OBS	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9
969	0	0	1	1	0	1	1	1	1
970	0	0	1	1	0	1	1	1	0
971	1	1	0	0	0	1	0	1	0
972	1	1	1	1	0	1	0	1	0
973	0	1	0	0	1	0	1	0	0
974	1	1	0	0	0	1	0	0	1
975	0	0	1	1	1	1	1	0	0
976	0	0	1	1	1	0	1	1	1
977	1	0	1	0	0	0	1	1	1
978	1	1	1	1	1	0	1	1	0
979	1	1	1	1	1	1	1	1	0
980	1	0	1	1	0	1	0	1	0
981	1	1	1	0	0	1	0	0	0
982	1	0	1	1	1	0	0	0	0
983	0	0	0	0	1	1	0	1	0
984	0	0	0	1	0	0	1	0	0
985	0	1	0	0	0	0	0	1	0
986	0	1	1	1	0	1	1	1	0
987	0	1	1	0	1	0	1	1	1
988	0	0	0	1	1	1	1	0	1
989	1	1	1	1	1	1	1	0	0
990	1	0	1	1	0	0	0	1	1
991	0	1	1	1	0	0	1	0	1
992	1	0	1	1	1	0	0	0	0
993	0	0	0	1	1	1	0	0	0
994	0	0	0	1	0	0	0	1	0
995	0	1	1	1	0	1	1	1	1
996	1	0	0	0	0	1	1	0	0
997	0	1	1	0	0	1	1	0	1
998	0	0	0	0	0	1	1	1	1
999	1	1	0	1	1	0	0	1	0
1000	0	0	1	0	0	0	1	0	0

```
      OBS     N    TOT     NUM      P        I    Y1     Y2     Y3     Y4     Y5     Y6
 Y7     Y8     Y9
        1     9    512    1000     0.5       1     1      0      1      0      1      1
 1      1      1
        2     9    512    1000     0.5       2     0      0      1      0      1      1
 0      1      0
        3     9    512    1000     0.5       3     0      1      0      1      1      1
 0      0      0
        4     9    512    1000     0.5       4     1      0      0      0      1      1
 0      0      0
        5     9    512    1000     0.5       5     0      0      1      1      0      1
 0      0      1
        6     9    512    1000     0.5       6     0      1      1      1      1      0
 1      0      1
        7     9    512    1000     0.5       8     0      0      1      0      1      1
 1      0      1
        8     9    512    1000     0.5       9     1      1      0      1      0      1
 1      1      1
        9     9    512    1000     0.5      10     1      0      1      0      0      1
 1      0      0
       10     9    512    1000     0.5      13     0      1      1      0      1      0
 0      0      0
       11     9    512    1000     0.5      14     0      1      1      0      1      1
 0      0      0
       12     9    512    1000     0.5      15     0      0      0      1      0      1
 1      0      0
       13     9    512    1000     0.5      16     0      0      1      1      0      1
 0      0      1
       14     9    512    1000     0.5      17     0      0      1      0      1      1
 0      1      1
       15     9    512    1000     0.5      21     1      0      0      1      0      1
 1      0      0
       16     9    512    1000     0.5      23     0      0      0      1      1      1
 0      1      1
       17     9    512    1000     0.5      25     1      0      0      1      0      0
 1      1      1
       18     9    512    1000     0.5      27     1      1      0      0      1      0
 1      0      0
       19     9    512    1000     0.5      28     0      1      0      1      0      1
 1      0      1
       20     9    512    1000     0.5      31     0      0      1      0      1      0
 0      1      1
       21     9    512    1000     0.5      33     1      0      0      1      1      0
 0      0      1
       22     9    512    1000     0.5      34     0      1      1      0      1      0
 1      0      0
       23     9    512    1000     0.5      35     0      1      1      0      1      1
 0      0      1
       24     9    512    1000     0.5      37     0      1      0      1      1      1
 1      1      0
       25     9    512    1000     0.5      38     0      1      1      0      1      0
 1      1      1
```

```
  OBS    N   TOT     NUM      P       I     Y1     Y2     Y3     Y4     Y5     Y6
Y7   Y8    Y9
   26    9   512    1000    0.5     39      1      1      0      0      0      1
0     1     1
   27    9   512    1000    0.5     41      1      0      0      0      0      0
1     1     0
   28    9   512    1000    0.5     42      0      1      1      0      1      1
0     1     1
   29    9   512    1000    0.5     43      1      1      1      0      1      1
0     0     0
   30    9   512    1000    0.5     44      1      1      0      0      0      1
1     1     1
   31    9   512    1000    0.5     45      0      1      1      1      1      1
0     1     0
   32    9   512    1000    0.5     46      0      1      0      0      0      1
1     1     1
   33    9   512    1000    0.5     47      1      1      0      0      1      0
0     0     0
   34    9   512    1000    0.5     48      1      1      0      1      0      0
0     0     0
   35    9   512    1000    0.5     49      1      0      1      1      1      0
0     1     0
   36    9   512    1000    0.5     50      1      0      1      1      0      0
0     0     1
   37    9   512    1000    0.5     51      1      1      0      1      1      1
1     1     1
   38    9   512    1000    0.5     52      1      1      0      1      0      1
1     0     1
   39    9   512    1000    0.5     53      1      0      1      0      1      1
0     1     1
   40    9   512    1000    0.5     54      0      0      1      1      0      1
1     1     1
   41    9   512    1000    0.5     55      0      0      0      0      1      1
0     1     0
   42    9   512    1000    0.5     58      0      0      0      1      1      0
1     0     0
   43    9   512    1000    0.5     59      1      1      1      0      0      0
1     1     0
   44    9   512    1000    0.5     60      0      1      1      1      0      1
0     0     0
   45    9   512    1000    0.5     61      0      1      0      0      0      1
1     1     0
   46    9   512    1000    0.5     62      0      0      0      1      1      0
0     1     1
   47    9   512    1000    0.5     63      0      1      0      1      1      1
1     1     1
   48    9   512    1000    0.5     64      1      1      1      1      1      0
1     0     0
   49    9   512    1000    0.5     66      1      1      0      0      0      0
1     1     0
   50    9   512    1000    0.5     68      0      1      1      1      1      1
1     1     0
```

```
  OBS    N   TOT     NUM      P        I     Y1     Y2     Y3     Y4     Y5     Y6
 Y7   Y8   Y9
   51    9   512    1000    0.5      70      1      0      0      1      0      1
  1    1    0
   52    9   512    1000    0.5      72      0      1      0      0      0      1
  1    1    0
   53    9   512    1000    0.5      73      1      1      0      1      0      1
  0    0    0
   54    9   512    1000    0.5      75      1      0      1      1      0      1
  0    1    0
   55    9   512    1000    0.5      76      1      1      1      1      1      0
  1    1    0
   56    9   512    1000    0.5      77      1      1      1      0      0      1
  0    1    1
   57    9   512    1000    0.5      79      1      1      1      0      1      0
  1    1    1
   58    9   512    1000    0.5      80      1      0      0      0      1      0
  0    1    1
   59    9   512    1000    0.5      81      1      1      0      0      0      0
  1    1    1
   60    9   512    1000    0.5      82      0      0      0      1      1      1
  1    0    0
   61    9   512    1000    0.5      83      0      0      1      1      1      0
 1    0    0
   62    9   512    1000    0.5      85      0      1      1      0      0      1
  0    1    1
   63    9   512    1000    0.5      86      0      0      0      1      1      1
  0    0    1
   64    9   512    1000    0.5      87      0      1      1      0      0      1
  1    0    0
   65    9   512    1000    0.5      88      1      1      1      1      1      0
  0    0    0
   66    9   512    1000    0.5      89      1      1      1      1      0      1
  1    0    0
   67    9   512    1000    0.5      90      1      1      0      0      0      0
  1    0    1
   68    9   512    1000    0.5      91      0      1      1      0      1      0
  0    1    1
   69    9   512    1000    0.5      92      1      0      1      0      1      1
  0    1    0
   70    9   512    1000    0.5      93      0      1      1      0      0      1
  0    1    0
   71    9   512    1000    0.5      94      1      1      1      0      0      0
  0    1    1
   72    9   512    1000    0.5      95      1      1      1      1      1      1
  1    0    0
   73    9   512    1000    0.5      96      0      0      1      1      1      0
  0    0    1
   74    9   512    1000    0.5      97      0      0      1      1      1      0
  0    1    1
   75    9   512    1000    0.5      99      0      1      1      1      1      0
  1    0    1
  OBS    N    TOT     NUM      P       I      Y1     Y2     Y3     Y4     Y5     Y6
Y7    Y8    Y9
   76    9    512    1000     0.5     101     1      1      1      1      0      1
 0     0     1
   77    9    512    1000     0.5     102     0      1      1      1      0      0
 1     0     0
   78    9    512    1000     0.5     103     1      1      0      1      1      0
 1     1     0
   79    9    512    1000     0.5     104     1      1      1      1      0      0
 0     0     1
   80    9    512    1000     0.5     105     0      1      1      1      0      0
 0     1     0
   81    9    512    1000     0.5     107     1      0      1      1      1      0
 0     0     1
   82    9    512    1000     0.5     108     1      0      1      1      1      0
 0     1     0
   83    9    512    1000     0.5     109     1      1      1      1      0      1
 0     1     0
   84    9    512    1000     0.5     110     1      1      1      0      0      0
 0     1     0
   85    9    512    1000     0.5     111     1      1      1      1      1      1
 0     1     1
   86    9    512    1000     0.5     112     1      1      0      0      0      0
 0     1     0
   87    9    512    1000     0.5     114     0      1      1      1      0      1
 1     0     0
   88    9    512    1000     0.5     116     1      0      0      1      1      1
 1     1     1
   89    9    512    1000     0.5     117     1      0      0      1      1      0
 1     1     0
   90    9    512    1000     0.5     118     0      1      1      0      1      0
 1     1     0
   91    9    512    1000     0.5     119     1      0      1      1      1      1
 0     1     1
   92    9    512    1000     0.5     120     0      1      1      1      1      0
 1     0     1
   93    9    512    1000     0.5     122     0      0      1      1      0      0
 0     1     1
   94    9    512    1000     0.5     123     1      1      1      0      0      1
 1     0     1
   95    9    512    1000     0.5     124     1      1      0      0      0      1
 0     1     0
   96    9    512    1000     0.5     125     1      1      1      1      0      0
 0     1     1
   97    9    512    1000     0.5     126     1      0      0      1      1      0
 0     0     0
   98    9    512    1000     0.5     127     1      0      0      0      1      1
 1     0     1
   99    9    512    1000     0.5     128     1      1      0      0      0      1
 0     0     1
  100    9    512    1000     0.5     129     1      1      0      0      1      1
 0     1     0
 OBS    N    TOT     NUM      P       I      Y1     Y2     Y3     Y4     Y5     Y6
Y7    Y8    Y9
 101    9    512     1000    0.5     130     1      1      1      1      0      1
0     1     0
 102    9    512     1000    0.5     131     0      1      1      0      0      1
0     1     1
 103    9    512     1000    0.5     133     1      1      0      1      0      1
0     0     1
 104    9    512     1000    0.5     135     0      0      1      0      1      0
0     1     1
 105    9    512     1000    0.5     136     1      1      1      1      1      1
1     1     1
 106    9    512     1000    0.5     138     1      1      1      1      0      0
1     1     0
 107    9    512     1000    0.5     139     1      1      0      0      1      0
0     1     1
 108    9    512     1000    0.5     140     0      1      1      1      1      1
0     0     1
 109    9    512     1000    0.5     141     1      0      0      1      1      1
0     0     1
 110    9    512     1000    0.5     142     1      1      1      0      0      0
1     1     1
 111    9    512     1000    0.5     143     0      1      0      1      1      1
0     0     1
 112    9    512     1000    0.5     145     0      1      1      0      1      0
1     1     1
 113    9    512     1000    0.5     146     0      1      0      1      0      1
1     1     1
 114    9    512     1000    0.5     147     1      1      0      1      1      1
0     0     0
 115    9    512     1000    0.5     148     0      0      0      1      1      0
0     1     0
 116    9    512     1000    0.5     149     1      0      1      1      1      0
0     0     0
 117    9    512     1000    0.5     150     1      1      0      1      0      0
0     0     1
 118    9    512     1000    0.5     151     0      1      1      0      0      0
0     1     0
 119    9    512     1000    0.5     152     0      1      0      1      1      0
1     0     0
 120    9    512     1000    0.5     153     1      0      0      1      1      0
1     0     1
 121    9    512     1000    0.5     154     1      1      1      1      1      1
0     1     0
 122    9    512     1000    0.5     155     1      0      0      1      1      0
1     0     0
 123    9    512     1000    0.5     157     0      1      1      1      0      0
1     0     1
 124    9    512     1000    0.5     158     1      1      0      1      1      1
0     0     0
 125    9    512     1000    0.5     159     1      0      1      1      1      1
0     1     1
```

```
  OBS    N    TOT     NUM      P       I      Y1     Y2     Y3     Y4     Y5     Y6
Y7   Y8    Y9
  126    9    512    1000    0.5     160      1      1      0      1      0      1
 1    0     0
  127    9    512    1000    0.5     161      1      1      1      0      1      1
 1    1     0
  128    9    512    1000    0.5     162      0      0      0      0      0      1
 1    1     1
  129    9    512    1000    0.5     163      0      1      0      1      1      1
 0    1     1
  130    9    512    1000    0.5     166      0      0      1      1      0      0
 0    0     1
  131    9    512    1000    0.5     168      1      1      0      1      0      1
 1    0     0
  132    9    512    1000    0.5     169      0      0      1      1      0      1
 0    1     1
  133    9    512    1000    0.5     173      0      1      0      0      1      1
 1    0     0
  134    9    512    1000    0.5     177      0      0      1      1      1      1
 1    1     1
  135    9    512    1000    0.5     178      1      0      1      0      0      1
 1    0     1
  136    9    512    1000    0.5     179      0      1      1      0      1      1
 0    1     1
  137    9    512    1000    0.5     180      1      1      1      0      0      0
 1    1     0
  138    9    512    1000    0.5     182      0      0      0      1      1      1
 1    0     1
  139    9    512    1000    0.5     183      1      1      1      0      0      1
 1    0     1
  140    9    512    1000    0.5     184      0      1      1      1      1      1
 0    0     0
  141    9    512    1000    0.5     185      1      1      1      0      1      0
 1    1     1
  142    9    512    1000    0.5     186      1      0      1      1      1      1
 0    1     0
  143    9    512    1000    0.5     187      1      1      0      0      1      0
 1    0     1
  144    9    512    1000    0.5     188      0      1      0      1      0      1
 1    0     1
  145    9    512    1000    0.5     189      0      0      1      0      0      1
 1    1     1
  146    9    512    1000    0.5     190      0      1      1      0      0      1
 1    0     0
  147    9    512    1000    0.5     191      0      0      0      0      0      1
 0    1     1
  148    9    512    1000    0.5     192      1      1      1      1      1      1
 0    0     0
  149    9    512    1000    0.5     194      0      1      1      0      0      1
 0    1     0
  150    9    512    1000    0.5     196      1      0      1      1      1      0
 0    0     1
```

```
  OBS    N    TOT     NUM      P       I      Y1     Y2     Y3     Y4     Y5     Y6
Y7    Y8    Y9
  151    9    512    1000     0.5     197      1      1      0      0      0      1
 1     1     0
  152    9    512    1000     0.5     200      1      0      0      1      1      0
 0     0     0
  153    9    512    1000     0.5     202      0      0      0      1      1      1
 1     1     0
  154    9    512    1000     0.5     203      1      0      0      0      1      1
 1     1     1
  155    9    512    1000     0.5     204      1      1      0      0      0      1
 1     0     0
  156    9    512    1000     0.5     205      1      1      0      1      1      1
 0     1     1
  157    9    512    1000     0.5     207      1      0      1      1      1      1
 0     0     1
  158    9    512    1000     0.5     209      1      0      1      1      1      0
 0     0     0
  159    9    512    1000     0.5     210      1      0      0      0      1      0
 1     1     0
  160    9    512    1000     0.5     213      1      1      0      1      0      0
 0     1     0
  161    9    512    1000     0.5     214      0      1      1      1      0      1
 0     1     0
  162    9    512    1000     0.5     215      1      1      0      1      1      1
 0     0     1
  163    9    512    1000     0.5     217      1      0      0      1      0      1
 1     0     0
  164    9    512    1000     0.5     220      0      1      0      1      1      1
 1     1     0
  165    9    512    1000     0.5     221      1      1      1      1      0      1
 0     1     0
  166    9    512    1000     0.5     222      1      0      1      0      1      1
 1     0     0
  167    9    512    1000     0.5     223      1      1      0      0      0      1
 0     0     0
  168    9    512    1000     0.5     224      0      0      1      1      1      0
 0     1     1
  169    9    512    1000     0.5     225      0      0      1      0      1      0
 1     1     0
  170    9    512    1000     0.5     226      0      0      0      1      0      0
 0     1     1
  171    9    512    1000     0.5     227      0      1      1      0      1      1
 0     1     0
  172    9    512    1000     0.5     228      0      0      1      1      0      0
 0     0     1
  173    9    512    1000     0.5     229      1      0      1      1      1      1
 0     1     1
  174    9    512    1000     0.5     230      1      1      1      1      0      1
 0     0     0
  175    9    512    1000     0.5     231      0      1      1      0      0      1
 0     1     0
```

```
  OBS    N    TOT     NUM      P       I     Y1     Y2     Y3     Y4     Y5     Y6
Y7   Y8    Y9
  176    9    512    1000     0.5     232     0      0      1      1      1      1
 0    1     1
  177    9    512    1000     0.5     233     0      1      1      0      0      1
 1    0     0
  178    9    512    1000     0.5     234     1      1      1      0      1      0
 0    0     0
  179    9    512    1000     0.5     235     1      1      1      1      0      0
 0    1     1
  180    9    512    1000     0.5     236     0      0      0      1      1      0
 1    0     1
  181    9    512    1000     0.5     237     1      1      1      1      1      1
 1    1     0
  182    9    512    1000     0.5     238     1      1      0      0      0      1
 1    1     1
  183    9    512    1000     0.5     239     1      0      1      0      0      1
 1    1     0
  184    9    512    1000     0.5     241     0      0      1      1      0      1
 0    1     1
  185    9    512    1000     0.5     243     1      0      1      1      1      1
 1    0     1
  186    9    512    1000     0.5     244     1      0      1      1      0      1
 0    0     0
  187    9    512    1000     0.5     245     1      0      0      1      1      0
 0    1     1
  188    9    512    1000     0.5     246     0      1      1      1      0      1
 0    1     0
  189    9    512    1000     0.5     248     1      1      1      0      1      0
 1    1     0
  190    9    512    1000     0.5     249     0      0      1      0      1      0
 1    1     1
  191    9    512    1000     0.5     250     1      1      0      1      0      0
 0    0     1
  192    9    512    1000     0.5     251     1      0      1      1      0      0
 0    1     0
  193    9    512    1000     0.5     252     0      0      1      1      0      1
 1    1     1
  194    9    512    1000     0.5     253     0      0      0      1      1      0
 1    1     0
  195    9    512    1000     0.5     254     0      1      1      0      1      0
 1    0     1
  196    9    512    1000     0.5     256     0      0      0      1      0      1
 1    1     0
  197    9    512    1000     0.5     257     1      1      1      1      0      1
 0    1     0
  198    9    512    1000     0.5     258     1      1      0      1      0      1
 1    1     1
  199    9    512    1000     0.5     260     0      1      0      1      0      0
 1    1     0
  200    9    512    1000     0.5     262     1      1      0      0      1      0
 1    1     1
```

```
  OBS    N   TOT     NUM      P       I      Y1     Y2     Y3     Y4     Y5     Y6
Y7   Y8    Y9
  201    9   512    1000     0.5     264      1      1      1      1      0      0
 0    1     1
  202    9   512    1000     0.5     265      0      0      1      1      1      0
 1    0     0
  203    9   512    1000     0.5     266      0      1      1      1      1      1
 1    1     1
  204    9   512    1000     0.5     267      1      0      1      1      0      1
 1    1     0
  205    9   512    1000     0.5     268      1      1      1      1      1      1
 0    1     1
  206    9   512    1000     0.5     269      0      0      1      0      1      1
 0    1     0
  207    9   512    1000     0.5     270      1      0      1      1      1      1
 1    0     0
  208    9   512    1000     0.5     271      1      1      1      1      1      0
 0    0     0
  209    9   512    1000     0.5     272      0      0      1      1      1      0
 1    1     0
  210    9   512    1000     0.5     273      1      1      0      0      1      1
 1    0     0
  211    9   512    1000     0.5     274      0      0      1      1      1      0
 1    1     0
  212    9   512    1000     0.5     275      0      1      1      1      0      1
 1    0     0
  213    9   512    1000     0.5     276      1      0      1      0      0      1
 1    1     0
  214    9   512    1000     0.5     278      0      0      0      1      1      1
 0    1     0
  215    9   512    1000     0.5     279      1      1      1      0      1      1
 1    1     0
  216    9   512    1000     0.5     280      0      1      1      1      1      1
 1    0     0
  217    9   512    1000     0.5     282      0      1      0      0      0      1
 1    1     0
  218    9   512    1000     0.5     283      0      1      1      0      0      1
 0    1     1
  219    9   512    1000     0.5     284      1      0      0      1      1      1
 0    1     0
  220    9   512    1000     0.5     285      1      0      1      0      1      1
 0    0     1
  221    9   512    1000     0.5     287      1      1      1      0      1      0
 0    0     1
  222    9   512    1000     0.5     288      1      0      0      0      0      0
 1    1     1
  223    9   512    1000     0.5     289      0      1      1      1      1      0
 1    0     1
  224    9   512    1000     0.5     290      0      0      0      0      1      1
 0    1     1
  225    9   512    1000     0.5     291      1      1      0      1      1      1
 1    0     1
```

```
  OBS    N    TOT     NUM      P       I      Y1     Y2     Y3     Y4     Y5     Y6
Y7   Y8    Y9
  226    9    512    1000    0.5     292     1      0      1      1      1      0
 1    0     0
  227    9    512    1000    0.5     295     1      0      0      0      1      0
 0    1     1
  228    9    512    1000    0.5     296     0      1      0      1      1      1
 1    1     0
  229    9    512    1000    0.5     298     0      1      0      0      1      1
 0    0     0
  230    9    512    1000    0.5     299     1      1      1      1      1      0
 1    1     1
  231    9    512    1000    0.5     300     1      0      1      1      1      1
 0    0     0
  232    9    512    1000    0.5     301     0      1      1      0      0      0
 0    1     1
  233    9    512    1000    0.5     302     1      1      1      1      1      0
 0    0     0
  234    9    512    1000    0.5     303     1      1      0      0      0      1
 0    0     1
  235    9    512    1000    0.5     304     0      0      1      1      1      0
 0    1     0
  236    9    512    1000    0.5     306     1      0      0      0      0      0
 1    1     0
  237    9    512    1000    0.5     307     0      1      1      1      1      0
 0    0     1
  238    9    512    1000    0.5     308     1      1      1      0      1      0
 1    1     1
  239    9    512    1000    0.5     309     1      1      1      1      0      1
 0    1     1
  240    9    512    1000    0.5     310     1      1      1      1      1      1
 0    0     0
  241    9    512    1000    0.5     311     1      1      1      1      1      1
 1    1     0
  242    9    512    1000    0.5     312     1      0      1      0      0      0
 1    1     0
  243    9    512    1000    0.5     314     0      0      0      0      1      1
 0    0     1
  244    9    512    1000    0.5     315     1      0      1      1      1      0
 0    1     1
  245    9    512    1000    0.5     316     1      0      0      0      0      1
 1    0     0
  246    9    512    1000    0.5     317     0      0      0      1      0      1
 1    1     0
  247    9    512    1000    0.5     318     0      1      0      1      0      0
 0    1     1
  248    9    512    1000    0.5     319     0      1      1      1      1      0
 1    0     1
  249    9    512    1000    0.5     320     1      0      0      1      1      1
 1    0     1
  250    9    512    1000    0.5     321     0      1      1      0      0      1
 0    0     0
```

```
  OBS    N   TOT     NUM      P       I     Y1     Y2     Y3     Y4     Y5     Y6
Y7    Y8    Y9
  251    9   512    1000     0.5     322     0      0      0      1      0      1
 1     0     0
  252    9   512    1000     0.5     325     0      1      0      0      1      1
 1     0     0
  253    9   512    1000     0.5     326     0      0      0      0      0      1
 1     1     1
  254    9   512    1000     0.5     327     1      0      1      1      1      0
 1     0     1
  255    9   512    1000     0.5     328     1      0      0      0      1      0
 1     1     0
  256    9   512    1000     0.5     330     0      1      0      1      0      0
 1     1     1
  257    9   512    1000     0.5     331     0      0      0      0      0      1
 1     1     1
  258    9   512    1000     0.5     332     0      0      0      0      0      1
 1     0     1
  259    9   512    1000     0.5     333     0      1      1      0      0      0
 0     1     1
  260    9   512    1000     0.5     334     1      1      0      0      0      1
 0     0     0
  261    9   512    1000     0.5     335     0      1      0      1      1      0
 0     0     0
  262    9   512    1000     0.5     336     0      1      1      0      1      1
 0     0     0
  263    9   512    1000     0.5     337     0      0      1      1      1      1
 0     0     1
  264    9   512    1000     0.5     339     1      0      1      1      0      1
 1     1     1
  265    9   512    1000     0.5     340     0      0      1      1      0      1
 0     1     0
  266    9   512    1000     0.5     341     1      0      1      1      1      1
 0     1     1
  267    9   512    1000     0.5     343     0      1      1      1      0      1
 1     1     1
  268    9   512    1000     0.5     344     1      0      1      0      1      1
 0     0     1
  269    9   512    1000     0.5     345     0      1      1      0      1      1
 1     1     1
  270    9   512    1000     0.5     346     1      1      0      1      1      1
 1     1     0
  271    9   512    1000     0.5     347     0      0      0      1      0      1
 0     1     1
  272    9   512    1000     0.5     348     0      0      1      1      1      0
 1     0     0
  273    9   512    1000     0.5     350     0      1      0      0      0      1
 0     1     1
  274    9   512    1000     0.5     351     1      1      1      0      1      1
 1     0     1
  275    9   512    1000     0.5     352     0      1      0      1      1      0
 1     0     0
```

```
  OBS    N   TOT     NUM      P      I     Y1     Y2     Y3     Y4     Y5     Y6
Y7    Y8    Y9
  276    9   512    1000    0.5    355     1      0      1      1      0      0
 1     0     1
  277    9   512    1000    0.5    356     0      0      1      0      1      1
 1     1     0
  278    9   512    1000    0.5    357     1      1      1      0      1      1
 1     0     0
  279    9   512    1000    0.5    358     0      0      1      1      0      1
 0     0     0
  280    9   512    1000    0.5    359     0      0      0      1      1      1
 0     1     0
  281    9   512    1000    0.5    360     1      1      1      1      0      0
 1     1     0
  282    9   512    1000    0.5    361     1      1      0      0      0      0
 0     1     1
  283    9   512    1000    0.5    363     0      0      1      1      1      0
 1     1     1
  284    9   512    1000    0.5    364     1      1      1      1      1      1
 1     1     0
  285    9   512    1000    0.5    365     0      1      1      1      0      1
 0     1     0
  286    9   512    1000    0.5    367     1      1      1      0      1      1
 1     0     1
  287    9   512    1000    0.5    368     0      1      0      1      0      1
 1     0     1
  288    9   512    1000    0.5    369     1      1      1      0      0      0
 1     1     1
  289    9   512    1000    0.5    371     0      1      1      1      0      1
 0     0     1
  290    9   512    1000    0.5    373     1      1      0      1      1      1
 0     1     1
  291    9   512    1000    0.5    374     0      0      1      0      1      1
 1     1     0
  292    9   512    1000    0.5    375     1      1      0      1      0      1
 1     1     1
  293    9   512    1000    0.5    376     0      1      1      1      1      0
 1     1     1
  294    9   512    1000    0.5    377     0      0      0      1      1      0
 0     0     1
  295    9   512    1000    0.5    379     1      1      1      0      1      1
 0     0     0
  296    9   512    1000    0.5    380     1      0      1      0      1      0
 0     1     1
  297    9   512    1000    0.5    382     1      1      1      1      1      0
 1     0     0
  298    9   512    1000    0.5    383     0      1      0      1      1      0
 1     1     1
  299    9   512    1000    0.5    384     0      0      0      1      1      0
 0     1     0
  300    9   512    1000    0.5    385     0      1      1      1      1      0
 1     1     1
```

```
  OBS    N    TOT     NUM      P       I      Y1     Y2     Y3     Y4     Y5     Y6
Y7    Y8     Y9
  301    9    512    1000     0.5     386     1      1      0      1      1      1
 1     0      0
  302    9    512    1000     0.5     387     0      0      1      0      1      0
 1     1      1
  303    9    512    1000     0.5     388     0      1      1      1      0      1
 0     0      0
  304    9    512    1000     0.5     389     1      0      0      0      1      1
 1     1      0
  305    9    512    1000     0.5     390     1      1      1      0      1      0
 0     1      0
  306    9    512    1000     0.5     393     0      0      0      0      1      1
 1     0      1
  307    9    512    1000     0.5     394     0      0      0      1      0      0
 0     1      1
  308    9    512    1000     0.5     395     0      1      1      1      1      1
 1     0      0
  309    9    512    1000     0.5     396     0      1      1      0      1      0
 1     0      0
  310    9    512    1000     0.5     397     1      1      0      1      1      1
 1     1      0
  311    9    512    1000     0.5     398     0      1      1      1      1      0
 0     0      1
  312    9    512    1000     0.5     399     0      1      0      0      1      1
 1     1      1
  313    9    512    1000     0.5     401     1      1      1      0      1      1
 1     1      1
  314    9    512    1000     0.5     402     1      1      1      1      1      1
 1     0      1
  315    9    512    1000     0.5     403     1      1      0      1      0      1
 0     0      1
  316    9    512    1000     0.5     404     0      0      0      0      1      0
 0     1      1
  317    9    512    1000     0.5     405     0      1      1      0      0      1
 0     0      1
  318    9    512    1000     0.5     406     0      0      1      1      0      0
 0     1      1
  319    9    512    1000     0.5     408     1      0      1      1      1      1
 1     1      0
  320    9    512    1000     0.5     409     0      1      0      0      1      1
 1     1      1
  321    9    512    1000     0.5     410     1      1      0      0      0      0
 1     1      1
  322    9    512    1000     0.5     411     1      1      1      0      1      1
 1     0      0
  323    9    512    1000     0.5     412     0      1      1      1      0      1
 0     1      0
  324    9    512    1000     0.5     414     1      0      1      1      0      0
 0     0      0
  325    9    512    1000     0.5     415     0      1      0      1      0      0
 1     1      0
 OBS   N   TOT    NUM     P      I     Y1    Y2    Y3    Y4    Y5    Y6
Y7   Y8    Y9
 326   9   512    1000   0.5    416     0     0     0     0     1     1
 1    0     1
 327   9   512    1000   0.5    417     1     0     0     1     0     1
 1    1     0
 328   9   512    1000   0.5    420     1     1     0     1     0     0
 1    1     1
 329   9   512    1000   0.5    421     1     1     0     1     1     1
 1    1     0
 330   9   512    1000   0.5    422     1     0     1     1     0     0
 0    1     1
 331   9   512    1000   0.5    423     0     0     1     1     0     1
 1    1     1
 332   9   512    1000   0.5    424     1     1     1     1     1     0
 0    0     0
 333   9   512    1000   0.5    425     0     0     1     0     1     1
 1    0     1
 334   9   512    1000   0.5    426     0     1     0     0     1     1
 1    0     1
 335   9   512    1000   0.5    427     1     0     0     0     1     0
 1    1     1
 336   9   512    1000   0.5    428     1     0     0     0     0     1
 0    1     1
 337   9   512    1000   0.5    429     1     1     0     0     0     1
 1    1     1
 338   9   512    1000   0.5    430     0     0     1     0     0     1
 1    1     0
 339   9   512    1000   0.5    431     0     1     1     0     1     0
 1    0     1
 340   9   512    1000   0.5    432     1     0     1     1     0     0
 0    0     1
 341   9   512    1000   0.5    433     0     1     1     1     0     0
 1    1     0
 342   9   512    1000   0.5    434     0     0     0     1     0     0
 1    1     0
 343   9   512    1000   0.5    435     1     1     0     0     0     0
 0    1     0
 344   9   512    1000   0.5    436     1     1     0     1     0     0
 0    1     1
 345   9   512    1000   0.5    437     1     1     1     1     1     0
 1    0     1
 346   9   512    1000   0.5    438     1     0     1     1     0     1
 0    1     0
 347   9   512    1000   0.5    440     0     1     1     0     1     1
 1    0     0
 348   9   512    1000   0.5    441     0     1     1     1     0     0
 1    1     0
 349   9   512    1000   0.5    443     0     1     1     1     0     0
 0    1     1
 350   9   512    1000   0.5    444     1     1     0     1     1     1
 1    0     0
```

```
  OBS    N    TOT     NUM      P       I      Y1     Y2     Y3     Y4     Y5     Y6
Y7   Y8    Y9
  351    9    512    1000     0.5     445     0      1      0      1      1      1
 1    0     0
  352    9    512    1000     0.5     446     1      1      1      0      0      0
 1    0     0
  353    9    512    1000     0.5     448     1      1      1      0      0      1
 0    0     1
  354    9    512    1000     0.5     449     1      1      1      1      1      0
 1    1     1
  355    9    512    1000     0.5     450     1      1      1      1      0      0
 1    1     0
  356    9    512    1000     0.5     451     0      0      1      1      0      0
 1    1     0
  357    9    512    1000     0.5     452     0      0      0      1      1      0
 0    0     1
  358    9    512    1000     0.5     453     0      1      1      1      1      1
 0    1     0
  359    9    512    1000     0.5     454     0      1      1      0      1      0
 1    0     1
  360    9    512    1000     0.5     456     0      0      0      0      1      0
 1    1     0
  361    9    512    1000     0.5     457     1      1      0      1      1      1
 0    0     0
  362    9    512    1000     0.5     458     0      1      0      0      0      1
 1    1     1
  363    9    512    1000     0.5     459     0      0      1      0      0      1
 1    0     0
  364    9    512    1000     0.5     460     0      0      1      0      1      1
 0    1     0
  365    9    512    1000     0.5     461     1      1      0      1      1      1
 0    0     1
  366    9    512    1000     0.5     462     1      0      0      0      1      1
 0    0     0
  367    9    512    1000     0.5     463     0      1      0      0      1      1
 1    0     1
  368    9    512    1000     0.5     464     1      1      1      0      0      0
 0    1     0
  369    9    512    1000     0.5     465     1      0      1      1      1      1
 0    0     0
  370    9    512    1000     0.5     466     1      0      1      0      1      0
 1    1     0
  371    9    512    1000     0.5     467     1      1      0      0      1      0
 0    1     1
  372    9    512    1000     0.5     468     0      0      1      0      1      0
 0    1     1
  373    9    512    1000     0.5     469     1      1      1      0      0      1
 0    0     0
  374    9    512    1000     0.5     470     1      1      0      1      0      1
 0    0     0
  375    9    512    1000     0.5     471     0      1      1      0      1      1
 1    0     0
```

```
  OBS    N    TOT     NUM      P       I      Y1     Y2     Y3     Y4     Y5     Y6
Y7   Y8    Y9
  376    9    512    1000     0.5     472     1      0      1      0      0      1
 1    0     1
  377    9    512    1000     0.5     473     0      0      1      0      1      0
 1    1     1
  378    9    512    1000     0.5     476     0      1      0      1      1      0
 1    1     0
  379    9    512    1000     0.5     477     0      1      0      0      1      1
 1    0     1
  380    9    512    1000     0.5     478     1      0      1      1      0      1
 1    1     1
  381    9    512    1000     0.5     479     1      1      0      1      1      0
 1    0     0
  382    9    512    1000     0.5     480     1      1      1      1      0      1
 0    0     1
  383    9    512    1000     0.5     481     0      0      1      1      1      0
 0    1     1
  384    9    512    1000     0.5     482     0      1      1      0      0      1
 0    1     1
  385    9    512    1000     0.5     483     1      1      0      1      1      1
 1    1     1
  386    9    512    1000     0.5     484     0      1      1      0      0      0
 0    0     1
  387    9    512    1000     0.5     485     1      0      1      1      1      1
 0    1     0
  388    9    512    1000     0.5     487     0      1      1      1      1      0
 1    0     1
  389    9    512    1000     0.5     488     0      1      0      1      0      0
 0    1     1
  390    9    512    1000     0.5     491     1      1      0      0      0      1
 1    1     1
  391    9    512    1000     0.5     492     0      0      1      1      0      1
 0    0     1
  392    9    512    1000     0.5     493     1      1      0      0      0      0
 0    1     1
  393    9    512    1000     0.5     494     0      1      0      0      0      1
 1    0     0
  394    9    512    1000     0.5     495     1      0      1      0      1      0
 1    1     1
  395    9    512    1000     0.5     496     1      0      0      1      0      1
 1    0     0
  396    9    512    1000     0.5     497     1      1      1      0      0      1
 0    0     1
  397    9    512    1000     0.5     498     1      0      1      1      1      1
 1    1     0
  398    9    512    1000     0.5     499     1      1      0      1      0      0
 0    1     1
  399    9    512    1000     0.5     500     0      0      1      0      1      0
 0    1     1
  400    9    512    1000     0.5     501     1      0      1      1      1      1
 0    0     1
```

```
  OBS   N   TOT    NUM      P       I     Y1    Y2    Y3    Y4    Y5    Y6
 Y7   Y8    Y9
  401   9   512    1000    0.5     502     0     0     1     1     1     1
  1    1     1
  402   9   512    1000    0.5     503     1     0     0     1     0     0
  1    1     1
  403   9   512    1000    0.5     504     0     0     1     0     1     1
  0    0     0
  404   9   512    1000    0.5     505     1     1     1     1     0     1
  0    1     0
  405   9   512    1000    0.5     506     1     1     0     1     1     0
  1    1     0
  406   9   512    1000    0.5     507     1     1     0     1     0     1
  0    0     1
  407   9   512    1000    0.5     508     0     0     1     1     0     1
  0    0     1
  408   9   512    1000    0.5     509     0     0     0     1     0     1
  1    0     0
  409   9   512    1000    0.5     510     1     1     1     1     1     0
  0    1     0
  410   9   512    1000    0.5     511     0     0     1     1     1     1
  0    1     0
  411   9   512    1000    0.5     512     0     0     0     1     0     0
  1    1     0
  412   9   512    1000    0.5     513     1     1     1     1     1     1
  0    1     0
  413   9   512    1000    0.5     514     0     1     1     1     1     1
  0    0     0
  414   9   512    1000    0.5     515     0     0     1     0     0     0
  0    1     1
  415   9   512    1000    0.5     516     1     1     1     0     1     1
  0    0     1
  416   9   512    1000    0.5     518     1     0     0     1     0     1
  1    0     0
  417   9   512    1000    0.5     519     1     1     0     0     0     0
  0    0     1
  418   9   512    1000    0.5     520     1     0     0     1     0     0
  1    1     1
  419   9   512    1000    0.5     521     0     1     1     0     1     1
  0    0     1
  420   9   512    1000    0.5     522     1     0     0     0     0     1
  1    0     0
  421   9   512    1000    0.5     523     0     1     1     1     0     1
  0    0     0
  422   9   512    1000    0.5     524     0     1     0     0     1     1
  0    0     0
  423   9   512    1000    0.5     526     1     0     1     1     0     1
  0    1     1
  424   9   512    1000    0.5     527     0     1     0     1     0     1
  1    0     1
  425   9   512    1000    0.5     528     0     0     1     1     0     0
  1    1     0
 OBS    N   TOT    NUM     P      I     Y1    Y2    Y3    Y4    Y5    Y6
Y7   Y8   Y9
 426    9   512    1000   0.5    529    0     0     1     1     1     0
1    0    0
 427    9   512    1000   0.5    530    1     0     0     1     1     1
0    0    0
 428    9   512    1000   0.5    531    0     0     0     1     1     0
0    1    0
 429    9   512    1000   0.5    533    0     0     1     1     1     1
1    1    1
 430    9   512    1000   0.5    534    0     0     1     0     1     0
0    1    1
 431    9   512    1000   0.5    536    1     1     0     1     0     0
0    1    1
 432    9   512    1000   0.5    537    0     1     0     0     0     1
1    0    1
 433    9   512    1000   0.5    538    0     0     0     1     0     0
0    1    1
 434    9   512    1000   0.5    539    1     0     1     0     1     1
1    0    1
 435    9   512    1000   0.5    541    1     1     0     0     1     1
0    0    1
 436    9   512    1000   0.5    542    0     0     1     0     1     0
1    1    0
 437    9   512    1000   0.5    543    0     1     0     0     0     1
1    0    1
 438    9   512    1000   0.5    544    1     1     1     0     1     0
1    0    0
 439    9   512    1000   0.5    545    1     1     0     0     1     1
1    1    1
 440    9   512    1000   0.5    546    1     0     1     1     0     0
1    0    0
 441    9   512    1000   0.5    547    0     1     1     0     0     1
1    0    1
 442    9   512    1000   0.5    548    1     0     1     1     0     0
1    1    0
 443    9   512    1000   0.5    549    0     0     1     0     0     1
1    0    0
 444    9   512    1000   0.5    550    0     1     1     0     1     1
1    0    0
 445    9   512    1000   0.5    552    1     1     0     0     0     1
1    0    1
 446    9   512    1000   0.5    554    0     0     1     1     1     0
1    1    1
 447    9   512    1000   0.5    555    1     1     0     0     1     0
0    0    0
 448    9   512    1000   0.5    556    0     0     1     1     0     0
1    1    1
 449    9   512    1000   0.5    557    1     0     1     0     1     1
1    0    0
 450    9   512    1000   0.5    558    1     1     1     0     0     0
0    1    0
```

```
  OBS    N    TOT     NUM      P       I      Y1     Y2     Y3     Y4     Y5     Y6
Y7    Y8    Y9
  451    9    512    1000     0.5     559      1      1      1      1      0      0
 1     1     1
  452    9    512    1000     0.5     560      1      1      0      0      1      0
 0     1     1
  453    9    512    1000     0.5     561      0      0      1      1      1      0
 1     1     0
  454    9    512    1000     0.5     563      1      1      0      1      0      0
 1     1     1
  455    9    512    1000     0.5     565      0      1      0      1      0      1
 1     1     1
  456    9    512    1000     0.5     566      0      1      1      0      0      1
 1     0     1
  457    9    512    1000     0.5     567      0      1      0      1      1      0
 0     1     0
  458    9    512    1000     0.5     568      0      1      0      0      0      1
 1     1     0
  459    9    512    1000     0.5     569      1      0      1      0      0      0
 1     1     1
  460    9    512    1000     0.5     570      0      1      1      0      1      1
 0     0     1
  461    9    512    1000     0.5     571      0      1      1      0      1      0
 0     1     0
  462    9    512    1000     0.5     574      1      0      1      0      0      1
 1     1     0
  463    9    512    1000     0.5     575      1      1      1      0      0      0
 0     1     1
  464    9    512    1000     0.5     576      1      1      1      0      0      1
 1     0     1
  465    9    512    1000     0.5     577      1      1      0      0      0      0
 1     0     0
  466    9    512    1000     0.5     578      1      1      0      0      1      0
 1     1     0
  467    9    512    1000     0.5     579      0      1      1      1      0      0
 1     0     0
  468    9    512    1000     0.5     580      1      0      0      0      0      1
 1     1     0
  469    9    512    1000     0.5     582      1      0      1      0      0      1
 1     1     0
  470    9    512    1000     0.5     583      1      0      0      1      1      1
 1     1     1
  471    9    512    1000     0.5     584      0      1      1      1      1      1
 1     0     0
  472    9    512    1000     0.5     585      0      0      1      0      1      1
 0     1     1
  473    9    512    1000     0.5     586      1      1      0      0      0      1
 1     1     0
  474    9    512    1000     0.5     587      0      0      0      0      1      1
 1     0     1
  475    9    512    1000     0.5     588      0      1      0      0      1      1
 1     0     0
```

```
  OBS    N   TOT    NUM      P      I     Y1    Y2    Y3    Y4    Y5    Y6
Y7   Y8    Y9
  476    9   512    1000    0.5    589     1     1     1     0     1     0
 1    1     1
  477    9   512    1000    0.5    591     0     0     0     1     0     0
 0    1     1
  478    9   512    1000    0.5    592     0     1     1     1     1     0
 1    1     0
  479    9   512    1000    0.5    593     1     0     0     1     1     0
 1    0     0
  480    9   512    1000    0.5    594     0     1     0     1     1     1
 0    0     1
  481    9   512    1000    0.5    595     1     0     1     0     1     1
 0    0     1
  482    9   512    1000    0.5    596     0     0     1     1     0     1
 1    0     0
  483    9   512    1000    0.5    597     1     1     0     1     0     1
 0    0     0
  484    9   512    1000    0.5    598     1     1     0     0     1     1
 1    1     1
  485    9   512    1000    0.5    600     1     1     0     1     0     0
 1    0     1
  486    9   512    1000    0.5    601     1     1     0     1     1     1
 1    0     0
  487    9   512    1000    0.5    602     1     0     0     0     0     1
 1    0     0
  488    9   512    1000    0.5    605     0     1     1     1     1     1
 1    1     0
  489    9   512    1000    0.5    606     1     1     1     1     0     0
 1    0     1
  490    9   512    1000    0.5    607     1     1     0     0     1     1
 0    0     0
  491    9   512    1000    0.5    608     1     1     1     0     0     1
 0    1     1
  492    9   512    1000    0.5    609     1     0     1     0     1     1
 1    1     1
  493    9   512    1000    0.5    610     1     1     0     0     0     1
 1    0     0
  494    9   512    1000    0.5    612     0     0     1     1     0     0
 0    1     1
  495    9   512    1000    0.5    613     0     0     1     1     1     0
 0    1     1
  496    9   512    1000    0.5    614     0     1     0     1     1     0
 1    0     1
  497    9   512    1000    0.5    615     1     1     0     0     0     0
 1    0     1
  498    9   512    1000    0.5    616     0     0     0     1     0     0
 1    1     1
  499    9   512    1000    0.5    617     1     1     0     0     0     0
 1    0     1
  500    9   512    1000    0.5    618     1     1     0     0     0     1
 1    1     0
```

```
  OBS    N   TOT    NUM      P      I     Y1    Y2    Y3    Y4    Y5    Y6
Y7   Y8    Y9
  501    9   512   1000    0.5    622    0     0     1     1     1     0
 1    1     0
  502    9   512   1000    0.5    624    1     1     1     1     1     0
 1    0     0
  503    9   512   1000    0.5    625    1     0     1     0     1     1
 0    0     0
  504    9   512   1000    0.5    626    1     1     0     1     1     1
 1    1     0
  505    9   512   1000    0.5    627    1     0     0     0     0     1
 1    1     1
  506    9   512   1000    0.5    628    0     1     1     1     1     0
 1    1     1
  507    9   512   1000    0.5    629    1     0     0     1     0     1
 0    1     1
  508    9   512   1000    0.5    631    0     0     0     1     1     0
 0    1     0
  509    9   512   1000    0.5    632    0     1     1     0     0     1
 0    1     1
  510    9   512   1000    0.5    633    0     0     0     0     1     1
 1    1     0
  511    9   512   1000    0.5    634    0     1     0     0     1     1
 1    1     0
  512    9   512   1000    0.5    635    1     0     0     0     0     1
 1    1     1
  513    9   512   1000    0.5    636    1     1     0     0     1     1
 0    0     0
  514    9   512   1000    0.5    637    0     1     0     1     1     1
 1    0     0
  515    9   512   1000    0.5    638    0     1     1     1     1     1
 1    0     1
  516    9   512   1000    0.5    639    0     0     0     0     0     1
 1    0     1
  517    9   512   1000    0.5    640    1     1     0     1     1     0
 1    1     1
  518    9   512   1000    0.5    642    1     1     0     1     0     0
 0    0     1
  519    9   512   1000    0.5    644    0     1     1     0     0     0
 1    1     1
  520    9   512   1000    0.5    645    1     1     1     1     1     0
 0    1     0
  521    9   512   1000    0.5    646    1     1     0     0     0     0
 0    1     0
  522    9   512   1000    0.5    647    1     1     1     0     1     1
 0    1     0
  523    9   512   1000    0.5    648    0     1     1     1     1     1
 0    0     1
  524    9   512   1000    0.5    649    1     1     1     1     0     1
 0    0     0
  525    9   512   1000    0.5    651    0     0     0     1     1     1
 1    0     1
```

```
  OBS    N   TOT     NUM      P      I      Y1     Y2     Y3     Y4     Y5     Y6
Y7   Y8    Y9
  526    9   512    1000    0.5    652     1      0      0      1      1      1
 1    0     1
  527    9   512    1000    0.5    653     1      0      0      1      1      0
 1    1     0
  528    9   512    1000    0.5    654     1      1      1      0      0      1
 1    1     0
  529    9   512    1000    0.5    657     0      0      0      1      0      1
 1    1     1
  530    9   512    1000    0.5    658     0      0      1      1      1      1
 0    1     1
  531    9   512    1000    0.5    659     0      1      1      0      0      1
 0    1     1
  532    9   512    1000    0.5    660     1      1      0      1      0      1
 0    0     1
  533    9   512    1000    0.5    661     1      1      0      1      1      1
 0    1     0
  534    9   512    1000    0.5    662     0      0      0      1      1      1
 1    1     1
  535    9   512    1000    0.5    664     0      1      1      0      1      0
 1    0     1
  536    9   512    1000    0.5    665     1      1      1      1      0      0
 1    0     1
  537    9   512    1000    0.5    666     1      1      1      0      1      0
 0    0     0
  538    9   512    1000    0.5    667     1      0      0      1      1      0
 1    0     0
  539    9   512    1000    0.5    668     0      1      0      0      1      0
 0    1     1
  540    9   512    1000    0.5    669     1      0      0      1      1      0
 1    1     1
  541    9   512    1000    0.5    670     1      1      1      0      1      0
 1    1     1
  542    9   512    1000    0.5    671     1      1      1      1      0      1
 0    1     1
  543    9   512    1000    0.5    672     1      0      1      1      1      0
 0    1     0
  544    9   512    1000    0.5    673     1      1      0      1      0      0
 0    1     1
  545    9   512    1000    0.5    675     0      1      0      1      1      0
 1    1     1
  546    9   512    1000    0.5    676     1      0      0      1      0      1
 1    0     0
  547    9   512    1000    0.5    678     0      0      1      1      1      0
 1    1     1
  548    9   512    1000    0.5    680     1      1      0      0      1      1
 0    1     0
  549    9   512    1000    0.5    681     1      0      1      1      1      0
 1    0     0
```

```
  OBS   N   TOT    NUM     P      I     Y1    Y2    Y3    Y4    Y5    Y6
 Y7   Y8   Y9
   550   9   512   1000   0.5    682     1     0     0     0     0     0
 0    1    1
   551   9   512   1000   0.5    683     0     1     0     1     1     1
 0    1    0
   552   9   512   1000   0.5    684     1     0     1     1     1     0
 0    1    0
   553   9   512   1000   0.5    686     1     0     0     0     1     1
 1    0    0
   554   9   512   1000   0.5    687     0     0     0     1     1     1
 1    1    0
   555   9   512   1000   0.5    688     1     0     1     0     1     0
 0    1    1
   556   9   512   1000   0.5    689     1     1     0     1     1     0
 1    0    0
   557   9   512   1000   0.5    690     0     1     0     0     1     1
 0    0    1
   558   9   512   1000   0.5    691     1     0     0     0     1     1
 0    0    0
   559   9   512   1000   0.5    693     1     0     1     1     0     0
 1    1    0
   560   9   512   1000   0.5    694     0     1     1     0     1     0
 0    0    0
   561   9   512   1000   0.5    697     0     1     0     0     1     1
 0    0    0
   562   9   512   1000   0.5    698     1     0     1     0     0     0
 1    1    0
   563   9   512   1000   0.5    699     1     0     1     1     1     1
 1    1    0
   564   9   512   1000   0.5    700     1     0     0     0     1     0
 1    1    1
   565   9   512   1000   0.5    701     0     0     1     1     1     1
 0    1    1
   566   9   512   1000   0.5    702     0     1     1     0     1     0
 0    1    0
   567   9   512   1000   0.5    703     0     1     1     0     1     0
 1    0    1
   568   9   512   1000   0.5    704     0     1     0     1     1     0
 1    1    0
   569   9   512   1000   0.5    705     1     0     0     1     1     1
 0    0    0
   570   9   512   1000   0.5    706     0     1     0     0     0     1
 1    1    1
   571   9   512   1000   0.5    707     1     1     0     0     1     1
 0    0    1
   572   9   512   1000   0.5    709     0     1     1     0     0     0
 0    0    1
   573   9   512   1000   0.5    710     1     1     1     0     1     1
 1    0    1
   574   9   512   1000   0.5    711     0     0     1     1     1     0
 1    1    0
```

```
  OBS    N    TOT     NUM      P       I      Y1     Y2     Y3     Y4     Y5     Y6
Y7   Y8    Y9
  575    9    512    1000     0.5     713      1      1      0      0      1      1
 1    1     1
  576    9    512    1000     0.5     714      1      0      1      1      0      0
 0    0     0
  577    9    512    1000     0.5     716      1      1      1      1      1      0
 0    1     1
  578    9    512    1000     0.5     717      0      1      0      1      0      1
 0    1     1
  579    9    512    1000     0.5     718      0      1      0      1      1      0
 0    0     1
  580    9    512    1000     0.5     719      1      0      1      1      1      0
 0    0     1
  581    9    512    1000     0.5     721      0      1      1      0      1      0
 0    1     0
  582    9    512    1000     0.5     722      1      1      1      1      1      1
 0    0     0
  583    9    512    1000     0.5     723      1      1      0      0      0      1
 1    1     1
  584    9    512    1000     0.5     724      0      1      1      1      1      1
 0    1     1
  585    9    512    1000     0.5     725      1      0      1      0      1      1
 1    0     1
  586    9    512    1000     0.5     726      1      1      0      0      0      0
 0    0     1
  587    9    512    1000     0.5     727      1      1      1      0      0      1
 0    0     1
  588    9    512    1000     0.5     728      1      1      1      1      0      0
 1    1     1
  589    9    512    1000     0.5     729      0      1      0      0      0      1
 1    1     1
  590    9    512    1000     0.5     730      1      0      0      1      1      0
 1    1     1
  591    9    512    1000     0.5     731      0      1      1      1      1      0
 0    1     0
  592    9    512    1000     0.5     732      1      0      1      1      1      0
 0    1     0
  593    9    512    1000     0.5     733      0      0      1      1      1      0
 1    0     1
  594    9    512    1000     0.5     734      1      0      0      1      0      0
 1    1     1
  595    9    512    1000     0.5     735      0      1      1      1      1      0
 0    0     1
  596    9    512    1000     0.5     736      0      1      0      0      0      1
 0    1     1
  597    9    512    1000     0.5     737      0      1      1      0      0      0
 1    1     1
  598    9    512    1000     0.5     738      0      0      0      1      1      1
 0    1     1
  599    9    512    1000     0.5     739      1      0      1      1      0      0
 0    0     0
```

```
  OBS   N   TOT    NUM     P      I     Y1    Y2    Y3    Y4    Y5    Y6
Y7   Y8   Y9
  600   9   512   1000    0.5    740    0     1     1     1     1     1
 0    1    0
  601   9   512   1000    0.5    741    1     0     0     1     1     1
 0    1    1
  602   9   512   1000    0.5    742    1     1     0     0     0     1
 0    1    1
  603   9   512   1000    0.5    743    1     1     1     1     1     0
 1    0    0
  604   9   512   1000    0.5    745    0     0     1     1     0     1
 1    1    1
  605   9   512   1000    0.5    747    0     1     1     0     1     1
 0    0    1
  606   9   512   1000    0.5    748    0     1     1     0     0     0
 1    0    0
  607   9   512   1000    0.5    750    0     0     1     0     0     0
 1    1    1
  608   9   512   1000    0.5    751    0     1     1     0     1     0
 0    0    1
  609   9   512   1000    0.5    754    1     0     1     0     1     1
 1    0    0
  610   9   512   1000    0.5    755    1     0     1     0     0     1
 1    1    1
  611   9   512   1000    0.5    756    0     1     1     1     1     1
 0    1    0
  612   9   512   1000    0.5    757    1     0     1     1     0     0
 0    0    0
  613   9   512   1000    0.5    758    1     1     1     0     1     1
 0    0    1
  614   9   512   1000    0.5    759    0     1     1     0     1     0
 1    1    0
  615   9   512   1000    0.5    760    1     0     1     0     1     1
 1    0    1
  616   9   512   1000    0.5    761    1     0     1     1     0     0
 0    1    1
  617   9   512   1000    0.5    762    0     1     0     0     1     1
 0    0    0
  618   9   512   1000    0.5    763    1     1     1     0     0     1
 0    0    1
  619   9   512   1000    0.5    764    1     0     1     1     1     1
 0    0    0
  620   9   512   1000    0.5    765    0     0     0     0     0     1
 1    0    1
  621   9   512   1000    0.5    766    1     0     0     0     1     0
 1    1    0
  622   9   512   1000    0.5    767    0     1     1     1     0     1
 0    0    1
  623   9   512   1000    0.5    768    1     0     1     1     1     0
 1    1    0
  624   9   512   1000    0.5    769    0     1     1     0     1     0
 0    1    0
```

```
  OBS    N    TOT     NUM      P       I      Y1     Y2     Y3     Y4     Y5     Y6
Y7   Y8    Y9
  625    9    512    1000    0.5     770     0      1      0      0      0      1
 1    0     1
  626    9    512    1000    0.5     771     0      1      1      0      0      0
 0    1     1
  627    9    512    1000    0.5     772     1      0      1      0      0      1
 1    1     0
  628    9    512    1000    0.5     774     1      1      0      0      0      1
 0    1     0
  629    9    512    1000    0.5     775     1      0      0      1      0      1
 1    1     1
  630    9    512    1000    0.5     776     1      1      0      1      0      1
 0    0     0
  631    9    512    1000    0.5     777     1      1      0      1      1      1
 1    0     1
  632    9    512    1000    0.5     778     1      0      0      0      1      1
 1    0     1
  633    9    512    1000    0.5     779     0      1      1      0      1      0
 0    1     1
  634    9    512    1000    0.5     780     1      0      0      0      1      1
 0    1     0
  635    9    512    1000    0.5     781     1      0      1      1      0      1
 0    1     1
  636    9    512    1000    0.5     782     1      1      1      1      0      1
 0    1     0
  637    9    512    1000    0.5     783     0      1      1      1      0      0
 1    1     1
  638    9    512    1000    0.5     785     1      1      1      1      1      1
 0    0     0
  639    9    512    1000    0.5     786     1      0      0      0      0      0
 1    1     0
  640    9    512    1000    0.5     787     0      0      0      1      1      1
 1    0     1
  641    9    512    1000    0.5     788     1      1      1      1      0      1
 1    0     0
  642    9    512    1000    0.5     789     1      0      1      1      1      0
 1    1     1
  643    9    512    1000    0.5     790     1      1      1      0      1      1
 1    1     1
  644    9    512    1000    0.5     792     0      0      0      1      1      1
 1    0     1
  645    9    512    1000    0.5     793     1      1      1      1      1      1
 0    1     1
  646    9    512    1000    0.5     794     1      1      1      0      1      0
 1    1     1
  647    9    512    1000    0.5     795     1      1      1      0      0      1
 1    0     1
  648    9    512    1000    0.5     796     1      1      1      0      0      0
 1    0     1
  649    9    512    1000    0.5     798     0      1      0      1      1      1
 0    1     0
```

```
  OBS    N   TOT     NUM      P      I     Y1    Y2    Y3    Y4    Y5    Y6
 Y7   Y8    Y9
  650    9   512    1000    0.5    799     1     1     1     0     1     0
 1    0     0
  651    9   512    1000    0.5    800     0     1     0     1     1     1
 0    1     0
  652    9   512    1000    0.5    801     1     1     1     1     0     1
 0    1     1
  653    9   512    1000    0.5    802     1     0     0     0     1     1
 1    0     1
  654    9   512    1000    0.5    803     1     0     1     1     1     1
 1    1     0
  655    9   512    1000    0.5    804     0     0     1     0     0     1
 1    1     1
  656    9   512    1000    0.5    805     1     1     1     1     1     0
 1    0     1
  657    9   512    1000    0.5    806     0     0     0     1     1     1
 0    0     1
  658    9   512    1000    0.5    809     0     1     0     0     0     1
 1    0     1
  659    9   512    1000    0.5    810     1     0     0     1     1     0
 0    0     0
  660    9   512    1000    0.5    811     1     1     0     0     1     0
 0    1     1
  661    9   512    1000    0.5    812     1     1     1     0     1     0
 0    1     0
  662    9   512    1000    0.5    813     0     0     0     0     1     0
 1    1     0
  663    9   512    1000    0.5    814     1     0     1     1     0     1
 0    0     0
  664    9   512    1000    0.5    815     1     1     0     0     1     1
 1    1     0
  665    9   512    1000    0.5    816     1     1     1     1     0     1
 1    1     0
  666    9   512    1000    0.5    817     0     1     1     0     0     0
 1    0     0
  667    9   512    1000    0.5    818     1     1     1     1     0     0
 0    0     0
  668    9   512    1000    0.5    819     1     1     0     1     1     1
 1    1     1
  669    9   512    1000    0.5    820     1     0     0     1     1     1
 1    0     0
  670    9   512    1000    0.5    821     0     0     1     1     1     0
 0    1     0
  671    9   512    1000    0.5    822     1     0     1     1     1     0
 0    0     1
  672    9   512    1000    0.5    823     0     0     1     0     0     1
 1    1     0
  673    9   512    1000    0.5    824     1     1     1     0     1     0
 0    0     0
  674    9   512    1000    0.5    828     1     1     0     1     1     1
 0    1     1
```

```
  OBS    N    TOT     NUM      P       I      Y1     Y2     Y3     Y4     Y5     Y6
Y7   Y8    Y9
  675    9    512    1000     0.5     829     0      0      1      1      1      0
 0    1     1
  676    9    512    1000     0.5     830     1      0      1      0      1      0
 1    1     1
  677    9    512    1000     0.5     831     1      0      0      1      0      0
 1    1     1
  678    9    512    1000     0.5     835     1      1      0      0      0      0
 1    1     0
  679    9    512    1000     0.5     836     1      1      1      0      0      1
 1    1     0
  680    9    512    1000     0.5     837     0      1      0      0      1      0
 0    1     1
  681    9    512    1000     0.5     838     1      1      0      1      0      1
 1    1     1
  682    9    512    1000     0.5     840     0      0      1      0      1      1
 1    0     0
  683    9    512    1000     0.5     841     0      1      1      0      0      1
 0    0     1
  684    9    512    1000     0.5     844     0      0      0      1      1      1
 0    1     1
  685    9    512    1000     0.5     845     1      0      0      1      1      1
 1    0     0
  686    9    512    1000     0.5     846     0      1      1      0      0      1
 1    1     1
  687    9    512    1000     0.5     847     1      0      1      1      1      0
 0    1     1
  688    9    512    1000     0.5     848     1      1      0      1      1      1
 0    0     0
  689    9    512    1000     0.5     849     0      0      1      1      1      1
 0    1     1
  690    9    512    1000     0.5     851     1      0      0      1      1      1
 0    0     0
  691    9    512    1000     0.5     852     1      1      0      1      1      1
 1    0     0
  692    9    512    1000     0.5     853     0      1      1      0      1      1
 1    1     0
  693    9    512    1000     0.5     854     1      1      0      1      0      1
 1    1     1
  694    9    512    1000     0.5     855     1      1      0      1      1      0
 1    0     0
  695    9    512    1000     0.5     856     1      1      1      0      1      1
 0    0     0
  696    9    512    1000     0.5     858     1      0      1      1      1      1
 0    0     1
  697    9    512    1000     0.5     859     0      0      1      0      0      0
 1    1     0
  698    9    512    1000     0.5     860     1      0      0      1      1      1
 0    1     1
  699    9    512    1000     0.5     861     0      1      1      1      1      1
 1    1     1
```

```
  OBS   N   TOT    NUM     P      I      Y1    Y2    Y3    Y4    Y5    Y6
Y7   Y8   Y9
  700   9   512    1000   0.5    863     0     0     0     0     1     1
 0    1    0
  701   9   512    1000   0.5    864     1     1     1     0     0     1
 1    0    1
  702   9   512    1000   0.5    865     0     0     0     0     0     1
 1    0    1
  703   9   512    1000   0.5    866     1     1     0     1     0     0
 1    0    1
  704   9   512    1000   0.5    868     1     1     1     1     1     1
 0    0    0
  705   9   512    1000   0.5    869     1     1     1     1     0     0
 0    0    1
  706   9   512    1000   0.5    870     1     1     1     1     0     0
 1    1    0
  707   9   512    1000   0.5    872     1     1     0     0     0     0
 1    0    0
  708   9   512    1000   0.5    873     1     0     0     1     0     1
 1    0    0
  709   9   512    1000   0.5    874     1     1     0     0     1     1
 1    1    1
  710   9   512    1000   0.5    875     0     0     1     1     1     0
 1    1    0
  711   9   512    1000   0.5    877     1     1     1     1     0     0
 1    0    0
  712   9   512    1000   0.5    879     0     1     1     0     1     0
 0    1    1
  713   9   512    1000   0.5    880     0     1     1     0     0     0
 1    0    1
  714   9   512    1000   0.5    882     0     0     0     1     0     0
 1    1    1
  715   9   512    1000   0.5    883     1     1     0     1     0     1
 0    0    1
  716   9   512    1000   0.5    884     1     0     0     0     1     1
 1    0    0
  717   9   512    1000   0.5    885     1     0     0     1     1     0
 1    0    1
  718   9   512    1000   0.5    886     0     1     0     1     1     0
 1    1    0
  719   9   512    1000   0.5    890     0     1     0     1     1     0
 0    0    1
  720   9   512    1000   0.5    892     0     1     1     1     1     1
 0    0    1
  721   9   512    1000   0.5    894     1     0     1     0     1     0
 1    1    0
  722   9   512    1000   0.5    895     0     1     1     0     0     1
 0    0    0
  723   9   512    1000   0.5    896     1     1     0     0     0     1
 1    0    1
  724   9   512    1000   0.5    897     1     0     0     1     1     1
 0    0    0
```

```
  OBS   N   TOT    NUM    P     I    Y1   Y2   Y3   Y4   Y5   Y6
Y7   Y8   Y9
  725   9   512   1000   0.5   898    1    1    1    1    1    1
 0    0    1
  726   9   512   1000   0.5   900    0    1    1    0    0    0
 0    1    0
  727   9   512   1000   0.5   901    1    0    0    1    1    1
 0    0    0
  728   9   512   1000   0.5   902    0    1    0    0    1    1
 1    1    1
  729   9   512   1000   0.5   903    1    1    0    1    1    0
 0    0    0
  730   9   512   1000   0.5   904    0    0    1    1    1    0
 1    1    0
  731   9   512   1000   0.5   905    0    0    0    1    1    0
 0    1    1
  732   9   512   1000   0.5   907    0    1    0    1    1    1
 0    0    1
  733   9   512   1000   0.5   908    1    0    0    0    1    1
 1    1    0
  734   9   512   1000   0.5   909    1    1    1    1    0    0
 0    0    0
  735   9   512   1000   0.5   910    1    1    1    1    1    0
 0    0    0
  736   9   512   1000   0.5   911    0    0    1    0    1    0
 1    1    0
  737   9   512   1000   0.5   912    0    1    0    1    1    0
 0    1    1
  738   9   512   1000   0.5   913    1    1    0    0    0    1
 0    0    1
  739   9   512   1000   0.5   914    0    0    1    0    0    1
 1    1    0
  740   9   512   1000   0.5   917    0    1    1    1    0    1
 0    0    1
  741   9   512   1000   0.5   921    0    0    1    1    0    0
 0    1    0
  742   9   512   1000   0.5   922    1    0    0    0    0    1
 1    1    0
  743   9   512   1000   0.5   923    1    1    0    1    1    0
 0    1    0
  744   9   512   1000   0.5   924    1    1    1    1    0    1
 0    0    0
  745   9   512   1000   0.5   925    0    0    1    1    0    0
 1    0    0
  746   9   512   1000   0.5   926    1    0    0    0    1    1
 0    0    0
  747   9   512   1000   0.5   927    1    0    1    1    1    0
 0    1    1
  748   9   512   1000   0.5   929    0    0    1    1    0    1
 1    1    0
  749   9   512   1000   0.5   930    1    1    1    0    0    0
 1    0    0
```

```
   OBS    N   TOT     NUM      P       I     Y1     Y2     Y3     Y4     Y5     Y6
Y7   Y8    Y9
  750    9   512    1000    0.5    931     0      0      1      0      1      1
 1    0     0
  751    9   512    1000    0.5    934     1      1      0      1      0      0
 0    1     1
  752    9   512    1000    0.5    935     0      1      0      0      1      1
 0    0     0
  753    9   512    1000    0.5    936     0      0      0      0      1      1
 1    1     1
  754    9   512    1000    0.5    938     1      0      0      1      1      1
 1    1     1
  755    9   512    1000    0.5    939     0      1      0      0      1      0
 1    1     1
  756    9   512    1000    0.5    940     0      0      0      0      0      1
 1    1     1
  757    9   512    1000    0.5    941     1      0      1      1      0      0
 1    0     1
  758    9   512    1000    0.5    943     0      1      1      0      0      1
 1    1     1
  759    9   512    1000    0.5    944     0      1      1      0      1      0
 0    1     0
  760    9   512    1000    0.5    946     0      1      0      1      1      0
 0    1     0
  761    9   512    1000    0.5    947     0      0      1      1      1      0
 1    1     0
  762    9   512    1000    0.5    948     1      0      0      0      1      0
 0    1     1
  763    9   512    1000    0.5    949     0      1      1      0      0      1
 1    0     0
  764    9   512    1000    0.5    950     1      0      1      1      1      1
 1    1     1
  765    9   512    1000    0.5    951     1      1      0      0      0      0
 1    0     0
  766    9   512    1000    0.5    952     1      0      1      0      0      1
 1    1     1
  767    9   512    1000    0.5    954     1      0      1      1      0      1
 0    0     0
  768    9   512    1000    0.5    956     1      0      0      1      0      1
 0    1     1
  769    9   512    1000    0.5    957     0      0      0      0      1      1
 1    1     1
  770    9   512    1000    0.5    958     0      0      0      1      1      1
 0    0     1
  771    9   512    1000    0.5    959     0      1      1      0      1      1
 0    1     0
  772    9   512    1000    0.5    960     0      1      1      0      0      1
 1    0     1
  773    9   512    1000    0.5    961     0      1      1      1      1      0
 1    1     1
  774    9   512    1000    0.5    963     1      0      0      1      0      1
 1    1     1
```

```
  OBS    N    TOT      NUM      P       I      Y1     Y2     Y3     Y4     Y5     Y6
Y7   Y8    Y9
  775    9    512     1000     0.5     965      1      1      0      1      0      0
 1    1     0
  776    9    512     1000     0.5     966      0      0      0      0      1      0
 1    1     1
  777    9    512     1000     0.5     967      1      1      0      0      1      1
 1    1     1
  778    9    512     1000     0.5     968      0      0      0      0      0      1
 0    1     1
  779    9    512     1000     0.5     969      0      0      1      1      0      1
 1    1     1
  780    9    512     1000     0.5     970      0      0      1      1      0      1
 1    1     0
  781    9    512     1000     0.5     971      1      1      0      0      0      1
 0    1     0
  782    9    512     1000     0.5     972      1      1      1      1      0      1
 0    1     0
  783    9    512     1000     0.5     974      1      1      0      0      0      1
 0    0     1
  784    9    512     1000     0.5     975      0      0      1      1      1      1
 1    0     0
  785    9    512     1000     0.5     976      0      0      1      1      1      0
 1    1     1
  786    9    512     1000     0.5     977      1      0      1      0      0      0
 1    1     1
  787    9    512     1000     0.5     978      1      1      1      1      1      0
 1    1     0
  788    9    512     1000     0.5     979      1      1      1      1      1      1
 1    1     0
  789    9    512     1000     0.5     980      1      0      1      1      0      1
 0    1     0
  790    9    512     1000     0.5     981      1      1      1      0      0      1
 0    0     0
  791    9    512     1000     0.5     982      1      0      1      1      1      0
 0    0     0
  792    9    512     1000     0.5     983      0      0      0      0      1      1
 0    1     0
  793    9    512     1000     0.5     986      0      1      1      1      0      1
 1    1     0
  794    9    512     1000     0.5     987      0      1      1      0      1      0
 1    1     1
  795    9    512     1000     0.5     988      0      0      0      1      1      1
 1    0     1
  796    9    512     1000     0.5     989      1      1      1      1      1      1
 1    0     0
  797    9    512     1000     0.5     990      1      0      1      1      0      0
 0    1     1
  798    9    512     1000     0.5     991      0      1      1      1      0      0
 1    0     1
  799    9    512     1000     0.5     992      1      0      1      1      1      0
 0    0     0
```

```
  OBS    N   TOT    NUM     P      I     Y1    Y2    Y3    Y4    Y5    Y6
Y7    Y8    Y9
 800    9    512   1000   0.5    995    0     1     1     1     0     1
1     1     1
 801    9    512   1000   0.5    996    1     0     0     0     0     1
1     0     0
 802    9    512   1000   0.5    997    0     1     1     0     0     1
1     0     1
 803    9    512   1000   0.5    998    0     0     0     0     0     1
1     1     1
 804    9    512   1000   0.5    999    1     1     0     1     1     0
0     1     0

                              OBS     _TYPE_     _FREQ_     Y1

                               1        0         804      437
```

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